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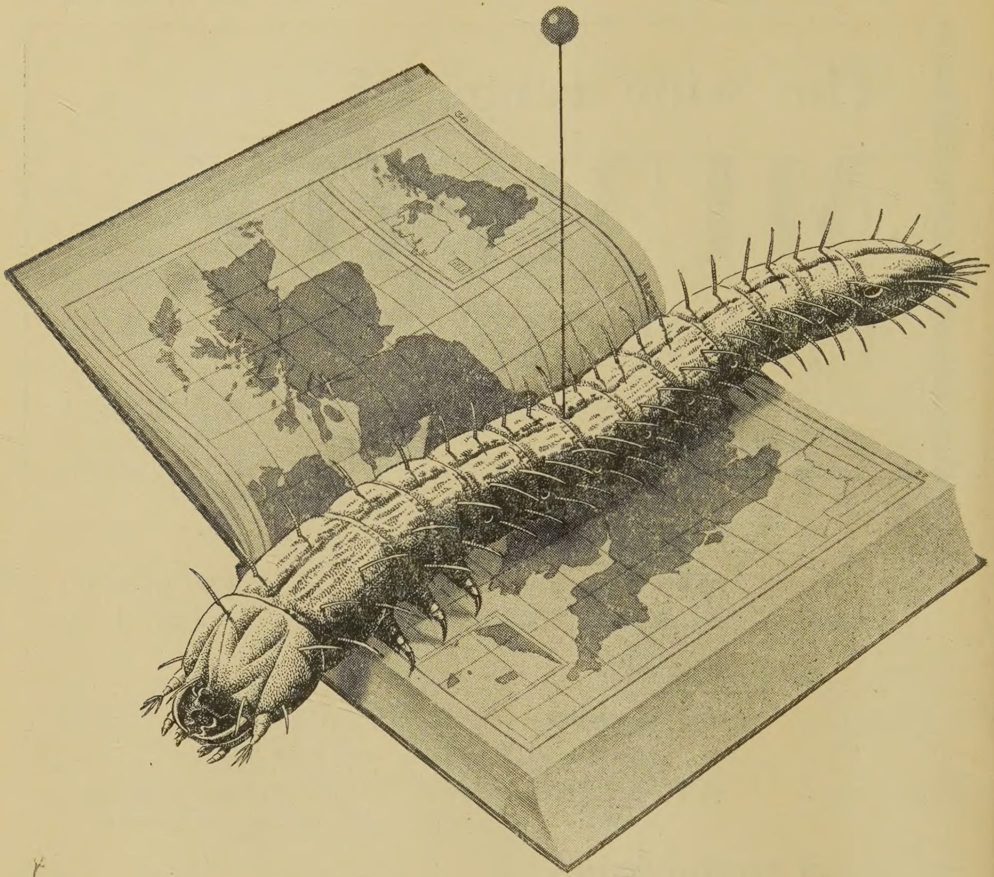

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SERIES A.

Vol. 43. 1955.

Report of the Sixth Commonwealth Entomological Conference 7th–16th July 1954.—iv + 344 pp., 5 figs., refs. London, Commonw. Inst. Ent., 1954. Price £1 10*s*.

In addition to an account of the Sixth Commonwealth Entomological Conference, which was held in London in July 1954, with the resolutions passed by it, this report includes six appendices. The first two of these (pp. 14–21 and 22–26) are memoranda on the work of the Commonwealth Institute of Entomology from 1st April 1948 to 31st March 1954 and on the history and work of the Commonwealth Institute of Biological Control, and the third (pp. 27–33) contains the proceedings of a general committee of the Conference and a committee set up to consider the supply and training of taxonomists. The fourth (pp. 34–150) comprises the text of the papers read at the scientific (open) meetings and reports of the discussions on them, and the fifth (pp. 151–160) contains two memoranda submitted in connection with these meetings, of which one is on Commonwealth resources for the identification of insects of economic importance, and the other, by H. F. Barnes, is on the gall-midges living on the sorghums, the *Panicum* millets and rice.

The sixth appendix (pp. 161–344) comprises a series of reviews of work on economic entomology in the various parts of the Commonwealth during 1948–54 that were presented to the Conference. Most of them were prepared by the chief entomologists of the government departments that deal with agriculture, but a few contain references to medical and veterinary entomology and two are solely concerned with tsetse flies. The countries (or organisations) from which they were received and the pages occupied by each are as follows: Australia, pp. 162–185; British Guiana, pp. 186–187; Canada (Division of Entomology, pp. 188–205, and Division of Forest Biology, pp. 206–224, 2½ pp. refs.); Cyprus, pp. 225–226; East Africa High Commission (Forest Entomology), p. 227, 1 ref.; Fiji (with references to other Western Pacific territories), pp. 228–232, 14 refs.; Gold Coast (Department of Agriculture, pp. 233–240, 3 refs., West African Cacao Research Institute, pp. 240–243, and Tsetse Control Department, p. 243); Jamaica, pp. 244–247; Kenya, pp. 248–257, 11 refs.; Malaya, pp. 258–280; Mauritius, pp. 281–284, 7 refs.; New Zealand, pp. 285–289; Nigeria, pp. 290–303, 8 refs.; Northern Ireland, pp. 304–305; Northern Rhodesia (Department of Game and Tsetse Control), pp. 306–309; Pakistan, pp. 310–318; Scotland, pp. 319–323, 69 refs.; Southern Rhodesia, pp. 324–329;

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Tanganyika, pp. 330–335, 12 refs.; Trinidad (Department of Agriculture, pp. 336–337, 7 refs., and Imperial College of Tropical Agriculture, pp. 337–338, 19 refs.); Uganda, pp. 339–340, 15 refs.; West Africa (Entomological Section of West African Institute for Trypanosomiasis Research), pp. 341–343, 3 refs.; Zanzibar, p. 344.

The papers read at the open meetings and published, with the discussions on them, in Appendix IV, were: Some recent Developments in the Use of Insecticides on Field Crops, pp. 35–41, by H. G. H. KEARNS; Aircraft Applications of Insecticides against Tsetse Flies and other Insect Pests in East Africa, pp. 44–48, 12 refs., by D. YEO; Recent Developments in the Use of Insecticides from Aircraft against Locusts, pp. 48–51, 9 refs., by R. C. RAINEY; Problems arising from the Use of Insecticides: Effect on the Balance of Animal Populations, pp. 53–57, 10 refs., by A. M. MASSEE; The Development of Resistance to Insecticides, pp. 60–65, 49 refs., by J. R. BUSVINE; The Estimation of real Losses from Insect Pests, pp. 75–78, 15 refs., by I. THOMAS; The Assessment of Insect Pest Density in Relation to Crop Losses, pp. 78–83, 3 figs., 1 ref., by A. H. STRICKLAND; The Influence of *Lygus vosseleri* on Crop Loss of Cotton in Uganda, pp. 83–86, 8 refs., by Q. A. GEERING; Biological Control Work on Cedar Scales [*Carulaspis visci* (Schr.) and *Lepidosaphes newsteadi* (Šulc) on *Juniperus bermudiana*] in Bermuda, pp. 89–93, by W. R. THOMPSON; The Biological Control of Weeds, pp. 95–98, by J. R. WILLIAMS; The Sorghum Midge Problem, pp. 101–104, 12 refs., by H. F. BARNES; The Stem-borer Problem in Tropical Cereal Crops, pp. 104–107, by J. BOWDEN; Developments in Work on Pests in Stored Products, pp. 110–113, by G. V. B. HERFORD; Some Problems in Forest-products Entomology, pp. 117–122, by R. C. FISHER; The Use of Virus Diseases against Sawflies [*Gilpinia hercyniae* (Htg.) and *Neodiprion sertifer* (Geoffr.) in Canada], pp. 122–124, by F. T. BIRD; Developments in Termite Research, pp. 126–130, by W. V. HARRIS; Development in Grasshopper Research and Control in Canada, pp. 133–137, 5 refs., by L. G. PUTNAM; Present Trends in Locust Research, pp. 137–141, by B. P. UVAROV; and Recent Advances in Tsetse Research and Control, pp. 143–147, by C. H. N. JACKSON. The rest of the appendix contains reports of the discussions on these papers and of a discussion on the supply and training of taxonomists (pp. 69–74) that was initiated by the memorandum on Commonwealth resources for the identification of insects of economic importance (Appendix V).

KIRBY (A. H. M.) & READ (W. H.). **The Toxicity of Phenyl Benzenesulphonate and some chlorinated Derivatives towards Eggs of certain Tetranychid Mites.**—*J. Sci. Fd Agric.* **5** no. 7 pp. 323–330, 19 refs. London, 1954.

The authors review work on the comparative toxicity of halogenated phenyl benzenesulphonates to Tetranychids [*cf. R.A.E.*, A **38** 377; **41** 171] and describe tests carried out in England by a dipping technique already noticed [**40** 146] in which phenyl benzenesulphonate and eight chlorinated derivatives of it were evaluated against the eggs of *Tetranychus telarius* (L.). These showed that compounds containing 3 or 4 chlorine atoms were of low ovicidal activity; 2,4-dichlorophenyl 2,4-dichlorobenzenesulphonate caused no mortality at 0·5 per cent., 4-chlorophenyl 2,4-dichlorobenzenesulphonate was somewhat toxic at 0·5 per cent. but non-toxic at 0·25 per cent., and 2,4-dichlorophenyl 4-chlorobenzenesulphonate was inactive at 0·2 per cent. in one test and somewhat toxic at 0·4 per cent. in another. Other tests indicated a median lethal concentration between 0·31 and 0·34 per cent. for the last compound, but the regressions were of doubtful linearity. Regression lines were drawn for the remaining six compounds, and the median lethal concentrations expressed as log molar concentration × 10^4 and (in brackets) per cent. were 0·72 (0·014) for 4-chlorophenyl benzenesulphonate, 1·04 (0·033) for 4-chlorophenyl 4-chlorobenzenesulphonate, 1·24 (0·053) for 2,4-dichlorophenyl benzenesulphonate, 1·34 (0·051) for phenyl benzenesulphonate, 1·99 (0·3) for phenyl 2,4-dichlorobenzenesulphonate and 2·4 (0·67) for phenyl 4-chlorobenzenesulphonate. At the 95 per cent. level of mortality, the corresponding figures were 1·73 (0·14), 1·96 (0·28), 1·88 (0·23), 2·06 (0·27), 2·47 (0·9) and 3·43 (7·24), and differences of at least 0·45 and 0·8 in the log molar figures at the two levels, respectively, were significant.

Considerable use has been made of 4-chlorophenyl 4-chlorobenzenesulphonate (Ovotran) in the United States and of 4-chlorophenyl benzenesulphonate in Britain against mites, and since esters in general may be hydrolysed by biological systems, five possible hydrolysis products of these two were tested. The results showed that neither phenol, 4-chlorophenol, 2,4-dichlorophenol, benzenesulphonic acid nor 4-chlorobenzenesulphonic acid was appreciably toxic at 0·5 per cent.

As 4-chlorophenyl benzenesulphonate and 4-chlorophenyl 4-chlorobenzenesulphonate have been shown to permeate leaves and kill eggs of *Paratetranychus pilosus* (C. & F.) (*Metatetranychus ulmi*, auct.) on the other side [*cf.* **41** 172], acetone solutions containing 5 per cent. of these compounds or phenyl benzenesulphonate, with 1 per cent. Triton X-100, were diluted in water (2:100) and brushed over the upper surfaces of apple leaves each bearing 200–600 summer eggs of *P. pilosus* on the lower surface. Counts made 18 days later showed that the first two caused 42·7 and 2 per cent. mortality, respectively, and phenyl benzenesulphonate none, as compared with no treatment.

It is concluded that chlorination in the para position on the phenyl ring enhances the ovicidal action of phenyl benzenesulphonate, whereas chlorination in the para position on the benzenesulphonic ring reduces it greatly. The effect of para-chlorination in both rings appeared to be greater than a summation of the effects of chlorination in each ring, though the difference was not significant.

El Nahal (A. K. M.). **Fumigation of agricultural Products. VIII. Penetration and Sorption of Methyl Bromide in Wheat fumigated at reduced Pressures.**—*J. Sci. Fd Agric.* **5** no. 8 pp. 369–373, 3 graphs, 10 refs. London, 1954.

Page (A. B. P.) & Blackith (R. E.). **IX. Sorption of Fumigants at reduced Pressures.**—*T.c.* pp. 373–376, 1 fig., 19 refs.

In the first of these two parts of a series, the author describes tests with methyl bromide as a fumigant for bagged wheat, carried out in the same way as those with ethylene oxide recorded in the preceding part [*R.A.E.*, A **42** 362], except for the method of determining the fumigant. It was found that penetration of the wheat occurred readily at atmospheric pressure, giving a penetration factor [*cf.* **41** 350] of 64 after four hours in wheat of 17 per cent. moisture content, as compared with 14·1 and 0·25 for ethylene oxide and hydrogen cyanide, respectively. Penetration was little improved by vacuum fumigation with either a sustained vacuum or simultaneous admission of air and fumigant, though the former produced some increase in residual fumigant.

When wheat containing 9 or 13 per cent. moisture was fumigated with sustained vacuum, the concentration inside the sack became higher than that in the free space; the same result was observed in wheat containing 13 or 17 per cent. moisture that was treated with ethylene oxide [*cf.* **42** 362]. Air-washing proved little more effective in removing methyl bromide from wheat that had been fumigated with simultaneous admission of fumigant and air than it did in removing HCN or ethylene oxide, in spite of the lower sorption of methyl bromide by the wheat. Residual methyl bromide recovered from the fumigated grain was generally related to the concentration–time product attained at the sample source, and was higher in the centre of a sack of dry wheat than near the periphery, whatever the method of fumigation.

The following is virtually the authors' summary of the second part. The adoption of vacuum-fumigation techniques alters the rate of penetration of fumigants into stored products. The sorption of fumigants by wheat and other seeds is known to depend on the concentration–time product attained at the position from which the sample for analysis is taken and on the shape of the curve representing the rise and fall of fumigant concentration at that position. Reports of laboratory investigations suggested that reduced pressure did not influence sorption, whereas trials on a pilot scale have suggested that some influence was exerted. This discrepancy can be eliminated by allowing for the influence of reduced pressures on the distribution of fumigants in space and time within the commodity during pilot-scale trials. Analysis showed that reduced pressures, as such, do not modify sorption.

LOVEDAY (D.). **Apparatus for the Determination of high Concentrations of Methyl Bromide in Fumigation.**—*J. Sci. Fd Agric.* **5** no. 8 pp. 376–381, 7 figs., 3 refs. London, 1954.

The following is virtually the author's summary. An apparatus is described for the determination of the concentration of methyl bromide in air over the range of 0–35 mg. per litre. It is based on the method of determination previously described by Call [*R.A.E.*, A **41** 348], which uses the length of coloured stain produced by interaction of bromine, as a combustion product of methyl bromide, with paper impregnated with fluorescein, but a swept-sample technique is used to obtain a representative sample, and buffered phenol red is employed as indicator.

MCKINLAY (K. S.). **Phytotoxicity of BHC to Cotton.**—*Emp. Cott. Gr. Rev.* **29** no. 4 pp. 269–272, 5 refs. London, 1952.

Since BHC sprays caused toxic symptoms on cotton in the course of field trials in Uganda, the effect of the compound was investigated on early-planted cotton in 1951. Sprays containing 0·065 and 0·025 per cent. γ BHC, prepared from a 6·5 per cent. dispersible powder or from a 3 per cent. emulsion concentrate were applied when the plants were 4–12 weeks old at 30–150 gals. per acre, according to the size of the plants, and symptoms leading to leaf mosaic and plant stunting were observed a week later. Individual plants varied greatly in susceptibility, but there was no evidence of differences in phytotoxicity between the two formulations. The age of the plant did not affect its susceptibility, but only young green tissue was affected. Leaves more than one inch long at the time of spraying and those that developed after it showed no symptoms. A single application at the lower concentration had little effect, but repeated applications caused some mosaic. A single application at the higher concentration frequently caused mosaic, and stunting was common when the treatment was repeated at weekly intervals. The weight of green bolls was not reduced, even on the plots that had shown the most severe symptoms, and it was therefore concluded that BHC applied at normal rates should have no harmful effects on yield. This was confirmed later in the year, when sprays of 0·025 per cent. γ BHC applied once a fortnight during most of the growing season caused no harmful effects and only slight visible symptoms.

Laboratory experiments showed that root growth was much reduced when cotton seedlings were grown in a culture solution containing small amounts of γ BHC from the emulsion concentrate, but it was much less affected by the same amount of γ BHC (purified) from an acetone solution.

In a discussion of these results, it is pointed out that the sprays might have affected the cotton through the action of the γ isomer as a growth-promoting substance [*cf.* *R.A.E.*, A **40** 81] or through the development of phytotoxic breakdown products of BHC [*cf.* **38** 445]. Since preparations of the pure isomer only slightly affected the growth of the seedling roots, breakdown products were probably responsible.

WHITCOMB (W.) & BRITTON (L. A.). **The Control of Cotton Bollweevil** *Anthonomus grandis* **Boh. in Venezuela.**—*Emp. Cott. Gr. Rev.* **30** no. 3 pp. 177–181, 2 pls., 2 refs. London, 1953.

Although *Anthonomus grandis* Boh. was not observed on cotton in the State of Aragua until 1949 [*cf.* *R.A.E.*, A **41** 325], it is believed to have existed in eastern Venezuela since 1942. Immediately after its discovery in Aragua, investigations on its bionomics and a drastic programme of direct and indirect control were begun. Old cotton stems and wild cotton (*Gossypium* spp.) were found to provide important sites for off-season breeding, and the weevil also bred on *Cienfuegosia affinis* [*cf.* **42** 371], but this was of little economic importance, as infestation occurred only during December and January. No indications of hibernation were found. Thickets of wild cotton could not be destroyed by hand, because of their extent, but tests of hormone weed-killers showed that 2,4,5-T [2,4,5-trichlorophenoxyacetic acid], alone or mixed with 2,4-D [2,4-dichlorophenoxyacetic acid], though ineffective in water emulsion, gave good control when sprayed in a petroleum product of the gas-oil type similar to Shell Weedkiller 20, a general contact herbicide used in the United States. Destroying the wild cotton was limited each year to the period between January and April, when other plants were dry and there was no cultivated cotton to which the weevils could migrate, and about 400 square miles were cleared of wild cotton in the first two years. The turning under of old cotton stems by growers before 15th February was enforced by law, and this gave a cotton-free period of almost four months, since little planting takes place before 15th June. The destruction of wild cotton and cotton stalks also practically eliminated attack by *Platyedra gossypiella* (Saund.), which destroyed about 20 per cent. of the crop annually until 1949.

To control the weevil on the crop, insecticides were applied when 10 per cent. of the squares were infested and, usually, again five days later. A dust of 20 per cent. toxaphene, applied at 13·5 lb. per acre, gave good control early in the season, but was less satisfactory later, possibly owing to its slow action, which reduced its efficiency considerably in rainy weather. A dust of 2·5 per cent. aldrin, applied at the same rate, proved rapid in action in tests at the end of the 1950 season, and it was used almost exclusively in 1951. It gave excellent control of *A. grandis*, but destroyed predators of *Heliothis armigera* (Hb.), and in 1952, 2 per cent. aldrin against *A. grandis* was combined with 5 per cent. each of DDT and toxaphene, for the control of *Heliothis* and *Alabama argillacea* (Hb.), respectively. As DDT appeared to affect the parasites of *Sacadodes pyralis* Dyar, which has recently increased in importance, still further modifications of the dust formula were contemplated in 1953.

Pearson (E. O.). **The Relationship between the African and South American Red Bollworms of Cotton,** *Diparopsis* **and** *Sacadodes.—Emp. Cott. Gr. Rev.* **31** no. 3 pp. 171–177, 1 fig., 20 refs. London, 1954.

Four species of *Diparopsis* are known from Africa [*R.A.E.*, A **40** 67]. Examination of the type specimen of *D.* (*Megalodes*) *watersi* (Roths.) from the Sudan and of Hampson's male of this species from Aden showed that *D. perditor* Clements [*cf. loc. cit.*] is identical with it. *D. watersi* was found in 1951 to be common on cotton at Lahej, near Aden, and was subsequently observed on cotton in the newly developed irrigation scheme at Abyan, in the Western Aden Protectorate. *D. tephragramma* B.-B. was taken in Angola in 1951, and *D. castanea* Hmps. in the Southern Province of Tanganyika in 1952, both on cotton.

Although the damage caused by *D. castanea* to cotton in the Lower River area of Nyasaland has been reduced by early planting and the reduction of competition from intercropped maize [*cf.* **34** 168, 332–333], the losses at higher altitudes, both in Nyasaland and in Southern Rhodesia, continue to be great, and the importation of parasites of *Sacadodes pyralis* Dyar, the South American red bollworm of cotton, for use against *Diparopsis* in Africa has been suggested. The distribution of *S. pyralis* is reviewed, and it is concluded that it may be confined to Central America and the north coast of South America; it was recently observed in Panama, Nicaragua [**41** 217] and Salvador [**42** 29]. It resembles *Diparopsis* in its mode of attack on cotton, and observations in Venezuela have shown that it also enters a diapause towards the end of the year [**42** 173] and has a wild food-plant of the genus *Cienfuegosia* [**42** 371]. Of its parasites, the most likely to be able to maintain itself on *Diparopsis* in Africa is *Apanteles thurberiae* Mues., which has been recorded from *S. pyralis* on cotton in Colombia [**29** 8, etc.], Nicaragua [**41** 217] and Venezuela [**42** 174], but it is not known whether it would prove more effective than the indigenous *A. diparopsidis* Lyle, which attacks *D. castanea* in Nyasaland and *D. watersi* in the Sudan. Further information is desirable on its actual effectiveness in America and its ability to survive in diapause from one cotton season to the next.

Geering (Q. A.) & Baillie (A. F. H.). **The Biology of Red Bollworm,** *Diparopsis watersi* **(Roths.) in northern Nigeria.**—*Bull. ent. Res.* **45** pt. 4 pp. 661–681, 1 pl., 7 figs., 20 refs. London, 1954.

The following is substantially the authors' summary. Earlier work on cotton pests in southern Nigeria is briefly reviewed, the main pests of the crop in northern Nigeria are listed, the climatic and agricultural background of the northern areas is described, and an account is given of observations on *Diparopsis watersi* (Roths.) [*cf.* preceding abstract] carried out in 1948–51 chiefly in the area of Samaru, in the north.

The main object of the work was to determine the annual cycle of activity of *D. watersi* on cotton in northern Nigeria. The insect passes the dry season in diapause as a pupa in the soil. Adult emergence begins in late May or June, but is interrupted during July–September. It is resumed in October, after the rains, and the main attack occurs on the crop during October and November. The proportion of pupae entering diapause rises rapidly from mid-October onwards, and activity ceases in early December. When diapause pupae were incubated at controlled temperature (86°F.) or indoor air temperatures (74–86°F.), emergence was unimodal, extending from June to October, with the peak in July or August, respectively. It is concluded that the bimodal emergence in the field is caused by waterlogging, or some other factor restricting aeration of the soil during July–September, when emergence from diapause pupae is interrupted.

Trials of dates of sowing showed that early sowings, made in mid-June or early July, may suffer heavier attack than those made in the second half of July. The earlier sowings nevertheless outyielded later ones. It is suggested that this results from a longer growing season, in which a greater production of fruiting points more than offsets greater losses from *Diparopsis* and other insects. Elimination of ratoon and standover cotton would prevent breeding by the moths emerging early from diapause pupae and the consequent attack on early sowings of cotton. The possibility of producing unimodal emergence from diapause pupae is worth attention. It might be achieved by altering soil conditions during July–September, and would, if successful, result in the virtual absence of damage to the main crop by *Diparopsis*.

There appear to be no fundamental differences in the bionomics of *D. castanea* Hmps. and *D. watersi*, as illustrated by previous work on the former in South Africa and Nyasaland [**31** 32; **34** 168, 332] and the observations on the latter here recorded, though *D. castanea* breeds on *Cienfuegosia hildebrandtii* in South Africa in addition to cotton [*cf.* **26** 199], whereas *D. watersi* has no known food-plant other than *Gossypium*.

NARAYANAN (E. S.) & CHAUDHURI (R. P.). **Studies on** *Stenobracon deesae* **(Cam.), a Parasite of certain Lepidopterous Borers of Graminaceous Crops in India.**—*Bull. ent. Res.* **45** pt. 4 pp. 647–659, 6 figs., 20 refs. London, 1954.

The following is almost entirely the authors' summary. Experiments were conducted at New Delhi to investigate oviposition and host selection by *Glyptomorpha* (*Stenobracon*) *deesae* (Cam.), a parasite of certain Lepidopterous borers of sugar-cane, maize and sorghum in India. The fecundity and sex ratio of this Braconid and the duration of its life-cycle were also studied [*cf. R.A.E.*, A **42** 137]. *Chilo zonellus* (Swinh.) and *Corcyra cephalonica* (Staint.) were used as hosts. The former is one of the principal hosts in the field, but the latter is not normally attacked. The female of *Glyptomorpha* normally avoids laying eggs on hosts that are already parasitised by its own species when unparasitised hosts are available, but in the absence of healthy hosts or when these are too crowded, parasitised hosts are attacked. At 26°C. [78·8°F.] and a relative humidity of 75 per cent., the life-cycle was completed, on an average, in 23·3 days, but under ordinary laboratory conditions it took 14·1 days in June–July (82–102°F. and 25–99 per cent. relative humidity) and 43·7 days in November–December (57–73°F. and 14–49 per cent. relative humidity). The average duration of adult life of females in June–February, mainly in ordinary laboratory conditions, was 35·7 days, and single females lived as long as 122 and 128 days. Adult males survived for an average of 42·7 days.

In the laboratory, the female laid an average of about 24 eggs, but only about one-third of them yielded adults. Males predominated. The sex ratio appeared to vary according to the host; among adults reared on *Chilo* larvae, 28·8 per cent. were females, but among others reared on *Corcyra* larvae, only 6·2 per cent. were females.

The phenomena of discrimination between parasitised and unparasitised hosts and the change of sex ratio with change of host are discussed. It is suggested that the ovipositor enables the parasite to recognise the host and that the stimuli received by the ovipositor from the host influence the functioning of the spermatheca, which in turn controls fertilisation and finally the sex of the progeny.

David (W. A. L.) & Gardiner (B. O. C.). **The Action of the systemic Insecticide Systox, on Aphids.**—*Bull. ent. Res.* **45** pt. 4 pp. 683–692, 8 refs. London, 1954.

The materials used in the experiments described, both of German manufacture and received in 1951, were Systox 50 emulsion, which was stated to contain 50 per cent. active ingredient and 50 per cent. emulsifier, and E 1059, the active ingredient itself, which was stated to be O,O-diethyl O-ethylmercaptoethyl thiophosphate [*cf. R.A.E.*, A **40** 326]. Gardner & Heath found that Systox 50 emulsion contained 48 per cent. active ingredient, 30 per cent. being O,O-diethyl S-ethylmercaptoethyl thiophosphate (S-isomer) and 18 per cent. O,O-diethyl O-ethylmercaptoethyl thiophosphate (O-isomer) [**42** 345], the active ingredient thus containing 62·5 per cent. of the S-isomer and 37·5 per cent. of the O-isomer, and other workers have found the active ingredient in samples of the product to contain 50 and 60 per cent. of the S-isomer [*cf.* also **41** 359]. The manufacturers stated in November 1953 that the ratio of O-isomer to S-isomer was 68:32, almost the reverse of these findings. The E 1059 used was shown by analysis to contain 50 per cent. of the S-isomer, the remainder being presumed to be the O-isomer, and the Systox 50 emulsion was assumed to contain 50 per cent. mixed isomers. In this paper, the name Systox refers to the mixture of toxic isomers, and an account is given of greenhouse tests of its value against Aphids, carried out mainly with *Aphis fabae* Scop. on broad beans by methods similar to those in earlier work [**39** 199].

In tests on contact action, in which leaves infested by *A. fabae* were dipped in various dilutions of Systox 50 emulsion or of E 1059 with a wetter, the former gave complete mortality in one day at concentrations of 0·0005–0·05 per cent. (v/v) Systox, but the latter only at a concentration of 0·005 per cent. Systox, the highest tested. When the leaves were reinfested five and ten days after treatment, the emulsion at a concentration of 0·005 per cent. Systox gave complete and partial mortality, respectively, within five days, whereas E 1059 had lost its effect by the second day. The difference may have been due to the wetting agents. In experiments on systemic action, the soil or sand in pots holding 400 gm. soil or 570 gm. moist sand in which broad-bean plants 6 ins. high were growing was treated with the emulsion at rates of 0·00002–0·01 cc. Systox in 20 cc. and E 1059 at rates of 0·00002–0·001 cc. in 20 cc. The emulsion gave complete mortality in two days on plants in sand at 0·01 and 0·002 cc. and on plants in soil at 0·01 and 0·02 cc., and these rates all gave complete mortality within two days when the plants were reinfested ten days after treatment. At 0·001 cc. Systox, the emulsion killed all the Aphids on the plants within four and six days of application to sand and soil, respectively, and E 1059 in six and seven days, respectively; Aphids placed ten days later on the plants in sand or soil treated with the emulsion and those in sand treated with E 1059 all died within five days, but mortality was not complete on plants in soil treated with E 1059. Plants 4–8 ins. high growing in sand watered with 100 cc. culture solution containing the emulsion or E 1059 renewed after five days were freed from infestation in one day by 0·005 per cent. Systox as the emulsion or E 1059, and in three and four days by 0·001 and 0·0005 per cent. Systox, respectively, in either form; at 0·0001 per cent. Systox, both materials caused colonies to decline after eight days. The highest concentration of the emulsion caused moderate damage to the plants. The dosage of Systox required to free a plant from

Aphids is shown to be 1 mg. per 400 gm. soil, whereas 20 mg. was the lowest dosage that caused a trace of damage to the plant. The safety margin in sand is similar. In another test, infested plants in soil watered with Systox at 0·01 and 0·001 cc. in 20 cc. per plant when they were 2 ins. high were quite healthy 32 days later, when they were 3 ft. high, whereas the untreated controls were stunted as a result of the infestation. In tests of the concentration of Systox in the plants necessary to kill Aphids, using the cut-taproot technique [**39** 200], a dose of about 1 mg. Systox per kg. fresh bean tissue gave complete mortality in ten days. Another test showed that plants with intact roots absorbed Systox from a solution as readily as others from which damaged roots were not removed. When brushed on to the lower leaves of a plant of which the upper ones were screened from direct fumigant action, Systox at 0·25 per cent. applied once killed all Aphids on the young unexpanded leaves in 1–3 days, but 0·01 per cent. Systox applied nine times over three days had no effect. In an experiment on fumigant action, in which a petri dish containing 1 or 0·1 per cent. Systox was placed within 1–1½ ins. of an infested bean leaf, all the Aphids died in about one day.

Less detailed experiments were made of the systemic action of Systox 50 emulsion against *Brevicoryne brassicae* (L.) and *Myzus persicae* (Sulz.) on cabbage seedlings. When watered on to the soil of plants in pots, it gave complete mortality in one day of *B. brassicae* at 0·0002–0·02 cc. Systox in 20 cc. and of *M. persicae* at 0·002 cc. Plants treated with 0·002 cc. Systox gave complete mortality within two days when reinfested with *B. brassicae* after 15 days and with *M. persicae* after ten; some mortality of the latter Aphid, but not the former, was given after 20 days. The plants were not damaged by the insecticide. The results of experiments on the translocation of Systox applied to the lower leaves of cabbage plants were inconclusive, but in some cases Aphids on the upper leaves were killed; there was some evidence that high concentrations of translocated insecticide were associated with severe leaf damage.

From a comparison of these results with those given by other systemic insecticides [**39** 199], it is concluded that the contact action of Systox against Aphids about equals that of paraoxon and exceeds that of schradan and bis(dimethylamino) fluorophosphine oxide (dimefox), and the systemic effect exceeds that of these three insecticides and equals that of sodium fluoroacetate.

DAVID (W. A. L.) & GARDINER (B. O. C.). **The Action of the systemic Insecticide Systox, on** *Pieris brassicae* **(L.) and** *Phaedon cochleariae* **(F.).**—*Bull. ent. Res.* **45** pt. 4 pp. 693–702, 1 fig., 6 refs. London, 1954.

The name Systox is here used to designate the mixture of O,O-diethyl O-ethylmercaptoethyl thiophosphate and O,O-diethyl S-ethylmercaptoethyl thiophosphate that forms the active ingredient in Systox 50 emulsion and other preparations [*cf.* preceding abstract], and the experiments described were carried out in the greenhouse by methods already noticed [*cf. R.A.E.*, A **39** 199] to evaluate its toxicity to the eggs and larvae of *Pieris brassicae* (L.) on cabbage and the eggs, larvae and adults of *Phaedon cochleariae* (F.) on turnip.

When leaves bearing eggs of the two species were dipped in solutions of Systox at concentrations of 0·001–0·1 per cent. v/v, those of *Pieris* developed but the larvae died on puncturing the shells; some of the *Phaedon* larvae hatched, and they were not killed by subsequent feeding on the treated foliage. In the tests on systemic action, 0·08 cc. Systox in 20 cc.

watered on 400 gm. soil in pots in which young cabbage plants bearing recently laid eggs of *Pieris* were growing prevented hatching; at 0·04 cc. it permitted 25 per cent. hatch but killed all the larvae, and at 0·02 cc. it permitted 50 per cent. hatch and killed 70 per cent. of the larvae. When Systox was brushed on to the upper surface of a young cabbage leaf directly over *Pieris* eggs laid on the lower surface, direct fumigant action being excluded, the results were rather variable, except at the highest concentrations used, but hatching was entirely prevented by 0·5 per cent. Systox, which damaged the edge of the leaf beyond the treated area. Eggs in batches that were not immediately below the treated area were sometimes killed. When applied to the surface of the older leaves, 0·1 per cent. Systox did not affect the development of eggs on the younger leaves or of the larvae that hatched from them.

In experiments with larvae, contact action was tested by dipping in solutions at various concentrations and transferring to filter paper and then to leaves. Systox gave 70 per cent. mortality of third-instar larvae of *Pieris* in two or five days at 0·4 per cent. and was ineffective at 0·1 per cent. At 0·2 per cent., it gave 60 and 70 per cent. mortality of second-instar larvae of *Phaedon* in two and five days, respectively, and was ineffective at 0·01 per cent. When untreated larvae fed on foliage that had been dipped in the solution and dried, 0·1 per cent. was the lowest concentration that was effective against second- and third-instar *Pieris* larvae and 0·2 per cent., the highest tested, was the only concentration that gave complete mortality, for which five days was required. This concentration also gave complete mortality of second-instar larvae of *Phaedon* after two days, 0·1 per cent. gave complete mortality after five days, and 0·001 per cent. was ineffective. Larvae of *Pieris* and *Phaedon* placed on plants five and four days, respectively, after the soil in which they were growing had been watered with Systox, were all killed in five days by Systox at 0·1 per cent. in the case of *Pieris* and 0·002–0·02 per cent. in that of *Phaedon*, and a concentration of 0·02 per cent. gave 90 per cent. mortality of *Phaedon* in two days. When brushed on to the lower leaves of cabbage and turnip plants over several days, Systox at 0·5 per cent. had no effect on larvae on the upper leaves and caused scorching. The lowest concentration of Systox in cabbage leaves necessary to kill larvae of *Pieris* was found to be between 140 and 310 mg. per kg. fresh leaf tissue. In tests with *Phaedon* adults, dipping the insects, or the leaves on which they were subsequently allowed to feed, in Systox solutions gave complete mortality only at a concentration of 0·2 per cent. A rate of 0·02 cc. in 20 cc. per plant gave complete or almost complete mortality when applied to the soil in which infested plants were growing, and lower rates were much less effective.

In tests of fumigant action, *Pieris* larvae confined on muslin over solutions of 0·1 and 1 per cent. Systox died in four days, and adults of *Phaedon* exposed in a similar manner to 1 per cent. Systox died in two days. When the solution was replaced by a leaf dipped in 0·2 per cent. Systox and dried, the insects were unaffected.

From comparison with work on other systemic insecticides against *Pieris* [**42** 143], it is concluded that Systox applied systemically is of little value against this species, though it prevents the larvae from hatching. It is of some value against larvae of *Phaedon*.

MILLER (N. C. E.). **Two new Species of Miridae (Hemiptera-Heteroptera).**—*Bull. ent. Res.* **45** pt. 4 pp. 703–705, 2 figs. London, 1954.

The new species are *Helopeltis anacardii*, which damages the shoots and young fruits of cashew (*Anacardium occidentale*) in Tanganyika, and

Eucerocoris festivus, from *Cinchona* in New Guinea. Both are described from adults of both sexes, and characters distinguishing them from allied species are included, with, in the case of *H. anacardii*, brief descriptions of the third- and fifth-instar nymphs.

Brown (E. S.). *Xyleborus morstatti* **Hag. (Coleoptera, Scolytidae), a Shot-hole Borer attacking Avocado Pear in the Seychelles.**—*Bull. ent. Res.* **45** pt. 4 pp. 707–710, 1 pl., 10 refs. London, 1954.

Xyleborus morstatti Hag., which has been recorded from avocado in Fiji [*R.A.E.*, A **29** 170] and Mauritius [**27** 611], was observed attacking that tree in a small planting in the Seychelles, causing the tips of the branches to die back. Affected branches were usually less than an inch in diameter and were characterised by the presence round the entrance holes of a white powdery substance, evidently produced by the tree as a reaction to attack. The tunnels were perpendicular to the surface, sometimes bifurcating, and reached the central pith, where they terminated in an enlarged cavity lined with fungal mycelium. Fungi isolated from infected twigs [*cf.* **21** 186] were identified as *Cladosporium cladosporiodes* and *Penicillium pallidum*. The cavities were found to contain 2–7 eggs, and 2–4 larvae, but rarely more than one adult. The world distribution and food-plants of *X. morstatti* are reviewed.

In an experiment on control, a pad of cotton-wool soaked in an emulsion concentrate diluted to contain 2·44 per cent. aldrin was lightly pressed over the entrance holes, so that a little of the liquid was expelled. Nine of ten adults recovered three days later were dead, and all of 16 larvae were dead or moribund. Further treatments were made after a fortnight and, where necessary, again after a further five weeks. All the trees appeared healthy five weeks after the third treatment.

Williams (G.). **Field Observations on the Cacao Mirids,** *Sahlbergella singularis* **Hagl. and** *Distantiella theobroma* **(Dist.), in the Gold Coast. Part III. Population Fluctuations.**—*Bull. ent. Res.* **45** pt. 4 pp. 723–744, 6 graphs, 7 refs. London, 1954.

The following is substantially the author's summary of this final part of a series dealing with *Sahlbergella singularis* Hagl. and *Distantiella theobroma* (Dist.) on cacao in the Gold Coast [*cf. R.A.E.*, A **41** 238, 442]. Both Mirids show a well marked annual population cycle [*cf.* **37** 88]. Numbers are lowest in March and remain low until July, though fluctuating from month to month. They then increase to a peak that may be bimodal, an earlier peak corresponding with maximum numbers on pods being followed by a later one on stems alone in January or February. There is subsequently an abrupt drop in the dry season to the minimum values of March. The increase in numbers is at first associated with increased numbers of cacao pods. Evidence is given, however, showing that Mirid increase is not determined by pod increase, but that both result from some common cause. The final peak in population is associated with symptoms of seasonal blast (a light but extensive killing of the terminal fans), but although Mirid numbers beneath the canopy are at their maximum at this time, there is no corresponding increase in the resident canopy population, the blast symptoms being produced by a transient population of adults from the sub-canopy levels. Even at their highest, the numbers of Mirids are small compared with most crop pests, the normal maximum being of the order of 1,000 per acre in mature stands.

Such aspects of mortality as could be studied from field observations are described. There is a steady loss during nymphal life, especially during the later instars, which last longer than the earlier ones. Parasitism, food-supply and predators appear to be the main controlling factors, but only predators are examined quantitatively. Mantids, ants and Reduviids kill 16–21 per cent. of the nymphs with which they are associated, and the proportion of Mirids killed by such predators increases with the number of Mirids present. Predators play an important part in natural control, but, although optimum conditions exist for them in Mirid pockets, they do not effect economic control. The use of ants for control is discussed and rejected. Their presence on trees uninfested by Mirids does not protect neighbouring infested trees, and, in an area subject to Mirid damage, uninfested trees are the only ones suitable for them to colonise. A single instance is cited in which *Oecophylla longinoda* (Latr.) appeared to exert control, but only at a level at which it was so numerous as to constitute a hazard to men working in the plot.

In a final discussion, attention is directed to aspects of Mirid biology that need immediate investigation. They include evaluation of the losses caused and the effect of physical factors on the Mirids. Suggestions are made for more accurate sampling methods that could be employed in future field observations.

YEO (D.). **Aircraft Applications of Insecticides in East Africa. IX. Further Experiments on the Deposition in open Country of a coarse Aerosol released from an Aircraft.**—*Bull. ent. Res.* **45** pt. 4 pp. 745–749, 3 graphs, 4 refs. London, 1954.

The following is the author's summary. Further experiments have been carried out to investigate how a coarse aerosol, released from a low-flying aircraft, is deposited upon the ground in open country [*R.A.E.*, A **42** 122]. The aerosol had a mass median diameter of approximately 80 microns, and was produced by a boom-and-nozzle apparatus.

The aircraft height was 65 ft. It is shown that the rate of deposition is related to the degree of atmospheric turbulence, of which a simple and easily measured parameter is given. The rate of deposition is greatest when there is a large temperature inversion and a low wind speed.

A comparison is made with previous work where the aircraft height was 30 ft. [*loc. cit.*]. Within the limits investigated, an increase in aircraft height reduces the deposits near the line of emission, but does not greatly affect the total amount that deposits within 150–200 seconds of production of the aerosol.

BANKS (C. J.). **A Method for estimating Populations and counting large Numbers of** *Aphis fabae* **Scop.**—*Bull. ent. Res.* **45** pt. 4 pp. 751–756, 1 graph, 4 refs. London, 1954.

The following is largely the author's summary. A method used for estimating changes in the population of *Aphis fabae* Scop. on plots of beans [*Vicia faba*] is described. It involved the classification of bean stems in the field according to five arbitrary classes of infestation and the removal to the laboratory of ten sample stems of each class for the estimation of Aphid numbers. This was done by a simple volumetric method, the Aphids washed from each stem being divided into sub-samples comprising those completely filling a tube 0·2 cc. in capacity and the mean number per sub-sample being calculated from six selected at random, for which accurate counts were made. The results obtained in sampling the populations present on three bean plots in southern England in 1952 are shown in tables.

Barnes (H. F.). **Gall-midge Larvae as Endoparasites, including the Description of a Species parasitising Aphids in Trinidad, B.W.I.**—*Bull. ent. Res.* **45** pt. 4 pp. 769–775, 12 refs. London, 1954.

Information on the Cecidomyiids that have been recorded as endoparasites is reviewed. They are *Endaphis perfidus* Kieff., which parasitises Aphids, *Endopsylla agilis* de Meij., which attacks *Psylla foersteri* Flor in Holland and with which a species that attacks other Psyllids in Scotland [*R.A.E.*, A **22** 603] and Germany [**31** 375] is probably identical, and *E. endogena* (Kieff.), which was found parasitising larvae of *Stephanitis pyri* (F.) in Portugal. Descriptions are given of the larva and adults of both sexes of *Pseudendaphis maculans*, gen. et sp. n., an endoparasite of various Aphids in Trinidad [*cf.* next abstract].

Kirkpatrick (T. W.) **Notes on *Pseudendaphis maculans* Barnes, a Cecidomyid Endoparasite of Aphids in Trinidad, B.W.I.**—*Bull. ent. Res.* **45** pt. 4 pp. 777–781, 1 fig., 3 refs. London, 1954.

The main host of *Pseudendaphis maculans* Barnes in Trinidad [*cf.* preceding abstract] is *Toxoptera aurantii* (Boy.). This Aphid is widely distributed on cacao, on which it was almost everywhere parasitised by the Cecidomyiid. It occurs less frequently on *Citrus*, but the only colonies seen were also heavily parasitised. Other hosts are *Pentalonia nigronervosa* Coq., which was parasitised on *Xanthosoma sagittifolium*, but not on banana, and *Aphis gossypii* Glov., which was attacked to some extent on *Citrus*, but not on egg-plant (*Solanum melongena*) or various cucurbits. Two apterae of *A. craccivora* Koch associated with *T. aurantii* on cacao shaded by *Gliricidia sepium* were parasitised, but this Aphid was not attacked on *G. sepium*, its normal food-plant. The Cecidomyiid is present throughout the year, but is commonest in the dry season, when large colonies of *T. aurantii* are most plentiful. Small colonies are often not attacked, but parasitism among colonies of 100 or more apterae sometimes reaches or exceeds 50 per cent. It was much higher among apterae than among alates, and it is thought that this may be due to inhibition of wing development as a result of parasitism. The evidence indicates that the Aphids are usually attacked during the first nymphal instar. The parasite larvae, of which only one develops in each host, become fully fed in 6–7 days. They pupate in the soil, and about 36 hours before they leave their hosts, the integuments of the latter become transparent, with numerous accumulations of granular matter visible. The host dies, without reproducing, shortly after the parasite has left, and the adult Cecidomyiid emerges 9–10 days after leaving the host. *T. aurantii* is largely controlled in the dry season by Coccinellids and Syrphids of the genus *Baccha*, and in the wet season also by entomogenous fungi, but *Pseudendaphis* contributes to its control, at least during the dry season.

Mathis (W.), Pickett (V. B.) & Miller (W. O.). **Chemical Control of Rice Field Mosquitoes in Mississippi.**—*Publ. Hlth Rep.* **69** no. 9 pp. 803–807, 3 graphs, 3 refs. Washington, D.C., 1954.

Rice-fields in Mississippi are normally flooded in May and drained 4–6 weeks later and allowed to dry to reduce populations of *Lissorhoptrus* *oryzophilus* Kuschel (*simplex*, auct.) [*cf. R.A.E.*, A **22** 498]. They are then flooded and usually remain under water until the grain is harvested. This cycle of water management favours the development of large adult populations of the mosquito, *Psorophora confinnis* (Lynch Arrib.) in June and July. Experiments on the control of the mosquito were therefore made in 1952 and 1953 [B **43** 7]. Preflooding treatment of the fields with 1 lb. dieldrin per acre, applied as a 1 per cent. emulsified solution, gave excellent reduction of populations of the mosquito and the weevil for about ten weeks. A dosage of 0·5 lb. per acre similarly applied four weeks later also gave excellent results for the remaining seven weeks of the rice-growing season, but its ability to maintain control for the whole season could not be demonstrated. The control of both the weevil and the mosquito effected by 0·25 lb. per acre was considered unsatisfactory. Postflooding applications of dieldrin-impregnated bentonite pellets [*cf.* B **40** 153] and broadcasting of dieldrin-treated pregerminated seeds, both to give a dosage of 1 lb. dieldrin per acre, effectively reduced populations of the weevil, though they were ineffective against the mosquito.

Sauer (H. F. G.). **Anormalidades observadas em algodoeiros tratados com doses excessivas de inseticidas.** [Abnormalities observed on Cotton Plants treated with excessive Doses of Insecticides.]—*Biológico* **19** no. 12 pp. 213–217, 7 figs. São Paulo, 1953.

Investigations in São Paulo in 1949–50 showed that cotton plants developed abnormally when dusted every ten days, beginning a month after germination, with mixtures of 3 per cent. γ BHC, 5 per cent. DDT and 40 per cent. sulphur or 20 per cent. toxaphene with 40 per cent. sulphur at a little over 11 and 22 lb. per acre, respectively, whereas those dusted every 25 days with the mixtures at about 11 lb. per acre or with 40 per cent. sulphur at either rate and both intervals developed normally. The affected plants were slender, with erect branches that were sometimes swollen, especially at the tips, the buds were irregularly placed, and the peduncles were either longer or shorter than usual. The leaves were not affected. The development of the bolls was apparently normal, though the yield was slightly reduced. When affected plants were pruned to a height of 10 ins., so that only one shoot was left, and were not dusted again, regrowth was somewhat retarded and the symptoms persisted.

Orlando (A.), Mariconi (F. A. M.) & Iba (S.). **O besouro de Limeira, praga de plantas frutíferas, eucaliptos e algumas outras culturas.** [*Colaspis quatuordecimcostata* Lefèvre, a Pest of Fruits, *Eucalyptus* and other Crops.]—*Biológico* **20** no. 1 pp. 1–10, 2 pls., 1 fig., 3 refs. São Paulo, 1954. (With a Summary in English.)

Colaspis quatuordecimcostata Lefèvre, the eggs and adults of both sexes of which are briefly described, has been present near Limeira, São Paulo, for several years, the population increasing annually, and in November–December 1953, very large numbers of adults of this Eumolpid were found there and at Piracicaba causing severe damage to many trees and plants of economic importance. *Eucalyptus citriodora* was preferred, the leaves and the bark on the branches being severely attacked, and the leaves of *E. alba* were severely damaged. Injury was also severe on the leaves and green fruits of apple, plum, vines and some varieties of avocado, the leaves of *Ricinus communis* and the young leaves and shoots of mango. Damage to beans, sugar-cane and maize was less severe.

The adults appear on the plants in late October or early November and were present in 1953–54 from late October to mid-January. The eggs are laid in groups just below the surface of leaf-covered soil, and the larvae are thought to feed on humus. Various insecticides in dusts or sprays were tested against the beetles in the laboratory, and it is concluded from the results, which are shown in tables, that the best for practical use are dusts of 5 or 10 per cent. DDT, 1 per cent. γ BHC (though this may taint any developed fruits present), or 0·5 per cent. methyl-parathion and sprays of 0·12–0·14 per cent. γ BHC or 0·4 per cent. toxaphene. Fairly good results were obtained in the field by dusting a small number of *Eucalyptus* trees with DDT and BHC, and the whole of the infested area was subsequently dusted with 2 per cent. γ BHC from an aeroplane.

Ebeling (W.). **Laboratory Experiments on the Control of three Species of Fruit Flies (Tephritidae).**—*Hilgardia* **21** no. 17 pp. 515–562, 15 figs., 11 refs. Berkeley, Cal., 1953.

Dacus cucurbitae Coq., *D. dorsalis* Hend. and *Ceratitis capitata* (Wied.) are serious pests in Hawaii and there is a risk of their introduction into the United States. In view of this, experiments were carried out in the laboratory in Honolulu in 1950 to evaluate 26 insecticides for their control. These were applied as aerosols, dusts or sprays to anaesthetised adults in a settling tower (space treatment) or to waxed cards or petri-dish covers that formed the ceilings of screen cages in which the insects were confined for 24 hours (residue treatment). The apparatus, which was based on the venturi principle, and the methods used are described. The insecticides were formulated as wettable powders, emulsion concentrates, kerosene solutions, and dusts, and all suspensions, emulsions and solutions were freshly prepared on the day they were used. Of the factors that might have caused variation in the results, natural mortality was of little importance. Anaesthesia with carbon dioxide had no effect in space treatments, but greatly decreased the percentage kill of flies confined with residues since it retarded their activity throughout the exposure period and consequently reduced the amount of toxicant absorbed through the tarsi. The percentage kill was higher with 25 flies per cage containing residue than with 50, because a larger proportion were resting or crawling on the residue at any one time. The males of *D. cucurbitae* and *C. capitata* were more susceptible to insecticides and those of *D. dorsalis* less so than the females. In tests with adults 1–17 days old, of all three species and of both sexes, older flies were markedly more susceptible to DDT in residues or space sprays than young ones.

Dosage-mortality curves for all the treatments against each species of fly are reproduced, and tables are given showing the toxicity indices [*cf.* *R.A.E.*, A **38** 426] for each insecticide and mode of treatment, calculated with the corresponding DDT formulation and also the emulsion concentrate of the particular insecticide concerned applied as a space treatment as the standards. The relative effectiveness of the insecticides varied with formulation, and when the indices based on comparison with DDT against all these species were considered together, the most toxic insecticides in emulsifiable concentrates, kerosene solutions, wettable-powder sprays and dusts were, respectively, paraoxon, pyrethrins, parathion and heptachlor. In general, kerosene solutions were superior to other formulations, both for space sprays and for leaving toxic residues. Emulsion concentrates were superior to wettable powders in space sprays but inferior in residues. Dusts were the least efficient formulation, but, unlike the others, they were as effective in residues as in space treatment. Both the time that a group of insects spends in contact with a residue and the speed with which they crawl on it affect the percentage kill, and inherent differences between species in these respects result in differences in susceptibility. Residues were most effective against *D. cucurbitae* and least so against *C. capitata*, and this order of susceptibility is in accordance with the activity of the flies.

In one series of tests, the settling tower was modified to permit comparison of insecticides acting at high concentrations in aerosols for short periods. When *D. dorsalis*, *C. capitata* and *D. cucurbitae* were exposed to emulsion concentrates diluted to give concentrations of 2, 4 and 5 gm. actual toxicant per 100 ml., respectively, and applied in this way, paraoxon and parathion gave complete kills of all three species, heptachlor of *D. dorsalis* and *D. cucurbitae*, Metacide (a mixture of 25 per cent. methyl-parathion and 6 per cent. parathion) of *C. capitata* and *D. cucurbitae*, and γ BHC of *C. capitata* after exposure for one second, whereas p,p′DDT, p,p′fluoro-DDT, p,p′DDD, p,p′methoxy-DDT (methoxychlor) and allethrin required 200 seconds or more. In further tests with *D. cucurbitae*, flies that survived contact for 24 hours with a DDT residue or that had survived for 48 hours after exposure to sprays of DDT or parathion in space treatments did not differ much from untreated flies in their subsequent rates of mortality and oviposition.

Insecticide residues in amounts sufficient to give 100 per cent. kill when first applied were tested for their ability to withstand weathering. When protected from sun and rain, spray residues of dieldrin, EPN (ethyl p-nitrophenyl thionobenzenephosphonate) and parathion gave complete kills of *D. cucurbitae* as long as 126 days after application. When exposed to sun and rain, dieldrin gave complete kill for a fortnight, but EPN and parathion lost much of their effectiveness in a week; DDT remained fairly effective for two weeks but lost all toxicity in three.

Ebeling (W.), Nishida (T.) & Bess (H. A.). **Field Experiments on the Control of the Melon Fly,** *Dacus cucurbitae.—Hilgardia* **21** no. 17 pp. 563–592, 3 figs., 10 refs. Berkeley, Cal., 1953.

Dacus cucurbitae Coq. is an important pest of cucurbits and tomatos in Hawaii, and field experiments on its control with insecticides that had proved effective in the laboratory [*cf.* preceding abstract] were carried out in 1950–51. The adults are known to pass most of the time on the vegetation surrounding the fields, only entering these to oviposit during daylight [*cf. R.A.E.*, A **39** 239], with the result that weekly applications of sprays and dusts were ineffective in tests in one tomato and one cucumber field, except at concentrations too high for public health standards. The main experiments concerned the spraying of rows of maize growing round the crop fields, which attracted many flies, or of the natural border vegetation, and this treatment had the advantage of avoiding poisonous residues on the crop. Sowing the maize in single or double rows and treating with highly concentrated sprays once a week, or twice if it rained, effectively protected cucumbers, watermelons and tomatos, and treating adjacent wild vegetation in addition added to the control. DDT, dieldrin, EPN [ethyl p-nitrophenyl thionobenzenephosphonate] and parathion as wettable powders were successfully used, and concentrations of 2, 1, 0·27 and 0·25 lb. actual toxicant, respectively, per 100 U.S. gals. spray are recommended. More concentrated sprays can be applied by means of a mist blower. Both surfaces of the leaves should be treated. If the vegetation already surrounding the fields is attractive to the flies [*cf. loc. cit.*], a maize border may be unnecessary, but in any case it should be sprayed as far as the spray stream will carry. The larger the field, the greater will be the effectiveness of the treatment, since the flies usually shelter on vegetation close to the edges.

Dunn (J. A.) & Wright (D. W.). **The Control of Pea Leaf Miners (Diptera, Agromyzidae).**—*3rd Rep. nat. Veg. Res. Sta. 1951–52* pp. 14–18, 1 pl., 1 ref. Wellesbourne, 1953.

The pea crop in eastern England is damaged by the pea moth [*Cydia nigricana* (Steph.)] and the pea Aphid [*Macrosiphum pisum* (Harris)] and occasionally by pea leaf-miners. These comprise Agromyzids of several species, of which *Phytomyza atricornis* Mg. outnumbered *Liriomyza* spp. in Lincolnshire in 1948 and was outnumbered by them at Cambridge in 1949. The eggs of these flies are deposited in incisions in the foliage and the larvae feed on the parenchyma. *P. atricornis* pupates in the mines, and the others do so in the ground. All also breed on other plants, including common weeds, and are probably most numerous where these are abundant.

In 1948, a field experiment was carried out to compare treatments against *C. nigricana*, but both this moth and the Aphid were of no importance, owing to cool wet weather. The leaf-miners were numerous on untreated plants, but much less so on plots receiving an emulsified solution containing 0·25 per cent. DDT as a fine spray on 25th June, ten days after flowering had begun, alone or with an additional application on 16th or 23rd July. From plant samples collected on 21st July, it was estimated that treatment reduced the percentage of leaves mined from 30 to 5 or less, causing considerable reductions in the numbers of large mines but much smaller reductions of small ones, which mainly occurred on foliage that had developed after spraying. Samples taken on 3rd August, just before harvest, showed significant increases in yield of dried peas from two applications, as compared with none, and significant increases in average numbers of pods per yard of row from all treatments, but the differences between treatments were not significant. An interval of four weeks between applications gave the best results, probably because the later spray coincided more closely with the appearance of the second generation of the leaf-miners.

In 1949, a single application of the same spray in a field test in Lincolnshire reduced leaf injury 15 days later from 25 to 8 per cent. In plot tests at Cambridge, samples taken eight days after the application of emulsion sprays showed that 0·4 per cent. DDT caused considerable mortality of larvae, particularly small ones, in the mines, whereas 0·05 per cent. parathion gave complete mortality of all larvae. The average number of mines per plant was reduced from 33 to 27·4 and 15·5, respectively.

It is concluded that the routine sprays applied against *C. nigricana* will protect the crop from leaf-miners and may increase yields by 5 cwt. (20 per cent.) or more dried peas per acre. Where treatment against the moth is not practised, sprays directed against the leaf-miners would be economically justified in seasons in which these are abundant. DDT should be used if either flies or small mines are found, and parathion if infestation is more advanced, with many larvae in the leaves.

Wright (D. W.) & Wheatley (G. A.). **A Comparison of the Effectiveness of certain Insecticides for the Control of the Cabbage Aphid** (*Brevicoryne brassicae* **L.**).—*3rd Rep. nat. Veg. Res. Sta. 1951–52* pp. 19–27, 1 graph, 23 refs. Wellesbourne, 1953.

An account is given of experiments in June–October 1951 in which cabbage plants growing in pots in the greenhouse were infested with *Brevicoryne brassicae* (L.) and subsequently treated with 0·025 per cent. parathion (in an emulsion), 0·1 per cent. HETP (hexaethyl tetraphosphate) or

0·005 per cent. γ BHC (in a suspension), all applied as fine mist sprays to the upper and lower surfaces of the leaves with no special precautions to prevent them from reaching the soil, or with 0·3 per cent. Pestox 3 (containing mainly schradan and triphosphoric acid penta (dimethylamide) [*cf. R.A.E.*, A **40** 147] applied to the soil only or to the plant only. The small overlapping heart leaves were not completely wetted by the sprays. Additional Aphids were added to the plants at intervals to test persistence of action, and the following is based on the authors' summary of the results.

The HETP and BHC sprays gave high initial kill of the Aphids that were wetted by them, but not of small colonies among the heart leaves; HETP did not affect the population for more than one day, but BHC remained very effective for three days. Aphids treated with parathion suffered high initial mortality, fresh colonies persisted and reproduced in the hearts of the plants after seven days, but not on the outer leaves until three weeks after spraying. Pestox 3 affected the Aphids more rapidly when applied to the foliage than when applied to the soil, but gave complete kill in five days and prevented re-infestation for a further nine days when applied in either way. In both series, small numbers of Aphids appeared on the heart leaves two weeks after spraying, but increase in numbers during the next two months was much slower than in the hearts of untreated plants, indicating that the insecticide was restricting reproduction throughout that period. The effect was more marked for the soil treatment than for the foliage spray. Aphids were unable to colonise the outer leaves of the treated plants for about three months, which indicates a prolonged residual action in these leaves. The effects of various factors on the rate of absorption and on the persistence of schradan-containing materials in plants are briefly discussed. Since the residues may only partly disappear before the onset of dormancy, toxic materials may persist in the marketed crop.

WHEATLEY (G. A.). **Rates of Change in Insect Populations for determining the Longevity of insecticidal Action.**—*3rd Rep. nat. Veg. Res. Sta. 1951–52* pp. 28–31, 4 graphs, 2 refs. Wellesbourne, 1953.

If the duration of effectiveness of an insecticide is measured by comparing the numbers of insects in treated and untreated populations at intervals, it is difficult to define the point at which toxicity ceases. A comparison of the relative rates of population change gives a better estimate, and such a method is particularly applicable to insects with a short life-cycle, in which the effect of the residue is rapidly reflected in the rate of reproduction. Since unrestricted reproduction usually results in an exponential increase in population with respect to time, a straight line should result when the logarithms of the numbers are plotted against time for a population increasing under uniform conditions. When an insecticide is applied to such a population, its effect is severe at first, causing a sharp decrease in numbers, but falls off, until the reproductive rate of the insect exceeds the mortality rate due to the insecticide, and finally disappears. At that point, the graph for the population again becomes a straight line, parallel with that for untreated insects, and observation of it gives a good estimate of the duration of insecticidal action. The situation in the field is more complex, as it is necessary to take into account wide variations in weather and the interaction between an insect and its natural enemies. The graphs will not then be linear, but as physical conditions are usually common to the whole of an experimental area, they should be reflected similarly in the changes that occur in both treated and untreated populations. If the insecticide is selective in its action, the degree of its selectivity determines the rate of steady multiplication achieved relative to that of untreated populations, but the latter is not fully discernible until residual action has ceased. In general, a non-selective insecticide should result in a greater rate of increase than that of an untreated population, as it removes the restraint imposed by natural enemies, and a selective insecticide in a lower rate of increase than that of an untreated population. If the insecticide is very persistent, it may be impossible to distinguish between selectivity and residual effect without supplementary observations.

GROSCHKE (F.). **Der Schwarze Nutzholzborkenkäfer, eine neue Gefahr für Forstwirtschaft, Obst- und Weinbau.** [*Xyleborus germanus* Bldf., a new Danger for Forestry, Fruit-growing and Viticulture.]—*Anz. Schädlingsk.* **26** pt. 6 pp. 81–84, 12 figs., 4 refs. Berlin, 1953.

Xyleborus (*Xylosandrus*) *germanus* Bldf., which was first found in Germany near Darmstadt in 1952 [*R.A.E.*, A **42** 57], was later observed at another place about 60 miles distant. It is normally a secondary pest of little importance, but may prove injurious on fruit trees and vines. Characters differentiating the adults and the galleries from those of the indigenous *X. dispar* (F.) are described.

BAAS (J.). **Das Auftreten der Veilchengallmücke in Hessen-Nassau in den Jahren 1951 und 1952.** [The Occurrence of the Violet Gall-midge in Hessen-Nassau in 1951–52.]—*Anz. Schädlingsk.* **26** pt. 8 pp. 113–118, 8 figs., 19 refs. Berlin, 1953.

Gall-midges have increased in recent years on wild and cultivated violets (*Viola*) in Germany, and outbreaks were recorded from several areas in 1951–52. Hairy galls were observed on leaves of *V. odorata* in Hessen-Nassau, and the adult Cecidomyiids, which possessed 15 antennal segments, were tentatively determined as *Dasyneura affinis* (Kieff.), though some authors ascribe smooth galls to *D. affinis* and hairy ones to *D. violae* (F.Lw.), which was originally described as having only 14 antennal segments. The taxonomy of these two species, which is somewhat confused, is reviewed from the literature, and it is considered possible that the appearance of the galls varies with the species of *Viola* infested. There were four generations a year in Hessen-Nassau in 1951–52, the adults appearing in maximum numbers during the last ten days of April, June and October and in the first ten days of September, but only three would be expected in years in which the weather in autumn was more severe. Good control was obtained by spraying with DDT when the adults were in flight.

SCHIMITSCHEK (E.). *Stephanopachys substriatus* **Payk., (Bostrychidae) als Zerstörer von Fichtengerbrinde.** [*S. substriatus* as a Pest of Spruce Bark for Tanning.]—*Anz. Schädlingsk.* **26** pt. 8 pp. 119–121, 2 figs., 6 refs. Berlin, 1953.

Spruce bark stored for tanning in Upper Austria was found in 1952 to be heavily infested by *Stephanopachys substriatus* (Payk.). This Bostrychid is comparatively rare in the field but has several times been recorded in stored bark [*cf. R.A.E.*, A **40** 253]. The adults appeared mainly at the end of May and the beginning of June, and some survived until the following January. Both larvae and adults fed on the bark, but chemical investigations showed that the excreta contained the same proportion of tannin as the undamaged bark, so that none was lost as a result of infestation. The larvae were destroyed by *Tenebroides mauritanicus* (L.).

Kraemer (G. D.). **Die kritischen Grenzen der Brutbaumdisposition für Borkenkäferbefall an Fichte** (*Picea excelsa* **L.**). **Untersuchungen zur Ökologie von** *Ips typographus* **L.,** *Pityogenes chalcographus* **L.,** *Polygraphus poligraphus* **L. und** *Dendroctonus micans* **Kug.** [Limits in the Condition of Host Trees critical for Infestation of Spruce by Bark-beetles. Investigations on the Ecology of *I. typographus*, *I. chalcographus*, *Polygraphus poligraphus* and *D. micans*.]—*Z. angew. Ent.* **34** pt. 4 pp. 463–512, 24 figs., 53 refs. Berlin, 1953.

The author developed a method of using the osmotic pressure of the sap as a measure of the susceptibility of silver fir (*Abies alba*) to attack by Scolytids [*R.A.E.*, A **40** 48], and in the investigations here described, which were carried out in outbreak areas in southern Germany mainly in 1949, the same technique was used to investigate the osmotic pressure in the bark of spruce, *Picea abies* (*excelsa*), attacked by *Ips typographus* (L.), *I.* (*Pityogenes*) *chalcographus* (L.), *Polygraphus poligraphus* (L.) and *Dendroctonus micans* (Kug.). Conflicting reports in the literature on the ability of these bark-beetles to attack healthy trees are reviewed.

The osmotic pressure in the living bark of healthy spruce in summer averaged 11–12 atmospheres in the crown, 10 in the trunk and 9–10 at the base. Reductions were caused by drought and by infestation or other damage in the crown, but a drop to 4 atm. was not necessarily fatal unless accompanied by injury. Beetles collected from freshly attacked bark or when flying to the trees were caged on selected trees, and observations were also made on naturally infested spruces. The maximum osmotic pressure in the bark of those in which *I. typographus*, *I. chalcographus* and *P. poligraphus* became established was about 6·5–7, 7·5–8 and 6 atm., respectively, so that all were secondary pests. In natural infestations, maximum attack by *I. typographus* and *I. chalcographus* occurred as soon as the trees became suitable for infestation, but *P. poligraphus* preferred bark with an osmotic pressure of 4–5 atm. *D. micans* successfully attacked healthy trees in the cage tests, but its preferred range was 5–8·5 atm. Where several species infested a single tree, the commonest order of succession was *I. chalcographus*, *I. typographus*, *P. poligraphus*.

The significance of the critical limits with respect to outbreak potentialities is discussed. Other factors, such as rate of increase, sometimes outweighed them and *I. typographus* was of more importance than *I. chalcographus*, although it selected weaker trees for attack. The development of *P. poligraphus* in bark with osmotic pressures above its preferred range was hampered by the flow of resin. Possible causes of local outbreaks of this species alone in Bavaria are discussed. *D. micans* was slow to establish itself in healthy trees, but larvae that moulted to the second instar while the trees were in a weakened state were unaffected by subsequent changes in osmotic pressure.

In investigations on the nature of the attraction of susceptible trees to the adults, batches of 50 normal examples of *I. typographus*, 40 from which one of the antennae had been removed, and 50 from which both had been taken were released between screens enclosing two adjacent trees, one of which had attracted numerous bark-beetles and the other none. The numbers found on the former two hours later were 41–43, 36 and 9–17, respectively, the remainder having settled on the screens or on the other tree. It is concluded that the beetles respond to a chemical stimulus, the nature of which is unknown. In further tests, trap-logs from which the branches had been removed did not become attractive to the beetles until a certain drop in the osmotic pressure in the bark had taken place, but the limits were above those for growing trees, owing to the reduced flow of resin. Logs exposed to the sun were especially attractive [*cf.* **38** 145].

KURIR (A.). **Die Frasspflanzen des Schwammspinners** (*Lymantria dispar* **L.**). **(Beitrag zur Ernährungsbiologie des Schwammspinners.)** [The Food-plants of *L. dispar*. (A Contribution to Knowledge of its Feeding Habits.)]—*Z. angew. Ent.* **34** pt. 4 pp. 543–586, 4 figs., 8 pp. refs. Berlin, 1953.

Lymantria dispar (L.) is a well-known polyphagous pest of trees and ornamental plants, but in order to assess the risk of infestation in mixed plant communities, an exact knowledge of its food-plants is required. Lists are given of those recorded in the literature up to 1952, arranged under the authors concerned, of the plants that were attacked readily, lightly or not at all in laboratory rearing tests in which the foliage of 300 species and varieties was offered to larvae in all instars, and of all the plants tested, arranged systematically with information on the chemical composition of the leaves so far as known. It is concluded that foliage containing large proportions of latex, lactic acid, essential oils, glycosides, saponins, alkaloids, tannins or bitter substances is either toxic or unacceptable to the larvae. The effects of different food-plants on the colour of the dried excreta are described.

BAKER (E. W.) & PRITCHARD (A. E.). **The** *geisenheyneri* **Species Group of the Genus** *Brevipalpus* **(Acarina: Phytoptipalpidae).**—*Ann. Mag. nat. Hist.* (12) **5** no. 54 pp. 609–613, 4 figs., 14 refs. London, 1952.

DOSSE (G.). *Tenuipalpus oudemansi* **Geijskes, eine für Deutschland neue Spinnmilbenart.** [*T. oudemansi*, a Species of Mite new to Germany.] —*Z. angew. Ent.* **34** pt. 4 pp. 587–597, 7 figs., 9 refs. Berlin, 1953.

The first paper includes a discussion of the synonymy of *Brevipalpus geisenheyneri* (Rübs.), and it is concluded that *B.* (*Tenuipalpus*) *oudemansi* (Geijskes) [*cf. R.A.E.*, A **27** 301] and *B. pyri* Taher Sayed [*cf.* **36** 412] are synonyms of it. *B. geisenheyneri* was originally described from *Cornus sanguinea* in Germany. It is here shown to be widely distributed in Europe and North Africa, and the author has received specimens of it from apple in Israel and Afghanistan [*cf.* also **42** 135]. A list of its food-plants is given. They are all deciduous and include several fruit trees.

The author of the second paper, who was apparently unaware of the first, states that *T. oudemansi* occurs in Holland and Egypt and was found in Germany for the first time in 1951, on apple near Stuttgart; lime [*Tilia*] was also lightly infested. All stages, including adults of both sexes, are described, and an account is given of observations on the bionomics of the mite carried out in 1952. It was then found to be common on apple, but occurred only on neglected trees. The females alone overwintered, in masses in cracks in the bark, and the number of mites per leaf increased from May to July, when it averaged 100 on one heavily infested tree. It then decreased slowly, but there was a second, minor, increase in September, after which there was a rapid decline. The proportion of males to females fell sharply from the end of September, and only isolated males remained in October. Pairing occurred on the leaves until the second half of September, the females apparently being fertilised in the nymphal stage. In the second half of October, mature females and female nymphs migrated to the twigs or trunks, where all completed development by mid-November and overwintered. Oviposition began in May, the eggs being laid along the veins, and reached an abrupt peak about mid-June, and the males became adult in July.

Obraztsov (N.). **Neue und wenig bekannte mediterrane Tortriciden-Arten (Lep., Tortr.).** [New and little-known Mediterranean Tortricids.]—*Eos* **26** pt. 3–4 pp. 299–319, 14 figs., 1 ref. Madrid, 1950.

The new species described include *Cydia* (*Laspeyresia*) *dannehli*, males of which were taken in Sicily and South Tyrol [*cf.* also next abstract]. The species closely resembles *C. pomonella* (L.).

Felderer (A.). **Der Marlinger Birnwurm.** [The Marling Pear-worm.]—*Landwirt* **22** pt. 1 pp. 17–19. 1950. (Abstr. in *Z. PflKrankh.* **57** pt. 3–4 pp. 135–136. Ludwigsburg, 1950.)

Cydia (*Laspeyresia*) *dannehli* (Obraztsov) [*cf.* preceding abstract] has been injurious to pear near Marling, South Tyrol, in recent years. It is further recorded from Spain, Sicily, Bukovina (Rumania) and the Ukraine, and its original food-plant is probably chestnut. On pear, the eggs are laid singly on the fruits, and the larvae enter the latter directly beneath the egg-shells and penetrate to the core, which they hollow out. Infestation does not become apparent until the larvae leave the fruits. They overwinter in the turf or soil and pupate in spring, and there is only one generation a year. Owing to the mode of entry into the fruits, no methods of control are known; those used against *C.* (*Carpocapsa*) *pomonella* (L.), including spraying with parathion, proved ineffective.

Baccolo (S.). **Esperimenti di lotta contro** *Cydia pomonella* **L.** [Experiments on the Control of *C. pomonella*.]—*Boll. Zool. agr. Bachic.* **18** fasc. 2–3 pp. 87–105, 1 pl., 1 graph, 25 refs. Milan, 1952.

Increased injury by *Cydia* (*Carpocapsa*) *pomonella* (L.) to pears in Italy since the war has been diversely attributed to poor quality of the lead arsenate used in sprays against it, to the presumed development of a strain resistant to lead arsenate, and to the effect of modern contact insecticides in reducing parasites. In addition, some workers have reported the presence in Upper Italy of *C.* (*Laspeyresia*) *dannehli* (Obraztsov) [*cf.* two preceding abstracts], which is not controlled by lead arsenate. The author considered, however, that the main factor was the neglect of the normal control measures during the preceding period, with a consequent great increase in populations in the orchards, and gives an account of studies in an orchard on Lake Garda in 1951 to investigate the various claims made and to test the effect of a complete programme of control. The experimental orchard consisted of 45,000 trees of different varieties. Sprays of 0·7–1 per cent. lead arsenate had been applied in 1948, 1949 and 1950, and over 35, 13 and 65 per cent. of the fruits were infested in those years, respectively. In 1950, three complete generations were observed, whereas the third generation is usually only partial.

Pear boxes were stacked in a closed storehouse that was heated from 20th April to 22nd May (when the average daily temperature was over 21°C. [69·8°F.]), to accelerate the emergence of adults from cocoons formed in the boxes. Adults of *C. pomonella* emerged between 26th April and 22nd July, with maximum numbers on 21st June. Small numbers of parasites, mainly Ichneumonids and *Perilampus tristis* Mayr, also emerged although contact insecticides had been applied in the orchard in previous years, but the only other species of *Cydia* observed was *C. molesta* (Busck). The parasites were released in the orchard. Further boxes in a refrigerated storehouse were fumigated with hydrogen cyanide.

The summer was not exceptionally hot, the temperature rarely exceeding 35°C. [95°F.]. Flowering lasted from 3rd to 25th April, and the first adult of *C. pomonella* was taken at light in the orchard on 5th May. Treatments were begun in mid-May, and sprays of 0·5, 0·7 or 1 per cent. lead arsenate or a mixture of 0·06–0·08 per cent. parathion with 0·5–1·2 per cent. lead arsenate were applied seven times before 21st August, late varieties receiving a final treatment on 30th August with lead arsenate at 0·7 or 1 per cent. or the parathion mixture. Rain frequently washed the deposits from the trees or delayed applications. On 13th July, following a hail storm that damaged about 15 per cent. of the fruits, 0·8 per cent. copper sulphate was added to the sprays. However, within ten days, the damaged fruits had split at the sites of the injury, facilitating the entry of the larvae, and it was later found that 80 per cent. of the fruits damaged by the hail were entered at the site of the injury. Fallen fruits, which were heavily infested, were collected from mid-July and removed from the orchard.

Picking began on 18th August, and the percentages of fruits found infested on the various varieties were 19–30·5 for 0·5 per cent. lead arsenate, 15–26 and 4·3–23 for two groups treated with 0·7 per cent. lead arsenate, 13–24 for 1 per cent. lead arsenate, and 1·7–23 for the parathion mixture.

To ascertain how long the deposits remained toxic to the larvae and at what intervals the sprays should be applied, larvae were enclosed with pears in gauze bags on the trees at various intervals after these had been treated with 0·5 or 0·7 per cent. lead arsenate. The insecticide remained effective for 15 days, after which the larvae were able to enter the fruits. Chemical analysis of samples of the lead arsenate used in the experiments, which came from two different manufacturers, showed requisite contents of arsenic pentoxide.

Examination of egg-shells adhering to pears picked in the orchard showed that hatching had in all cases occurred through the side, as is characteristic for *C. pomonella*, and there was no evidence of the presence of *C. dannehli*. The egg stage lasted 11 days at the beginning of June and seven days at the end of the month, at minimum and maximum temperatures of 16 and 30°C. [60·8 and 86°F.]. The larvae wandered over the fruits for several hours seeking sites for entry, and it seems probable that entry can be effected at points where other larvae have removed the layer of insecticide. The complete life-cycle lasted about 40 days in June–July. The first and second generations overlapped, and there was not even a partial third generation in 1951, for when fruits containing almost mature larvae were caged on 20th August, the larvae left them and spun cocoons but did not give rise to adults before the end of the year. No evidence of arsenic-resistance was observed, and the wide variations in the percentage infestation in the different years in which arsenical sprays were applied do not support its alleged development.

Baccolo (S.). **Esperimenti di lotta contro** *Pseudococcus citri* **Risso.** [Experiments on the Control of *Planococcus citri*.]—*Boll. Zool. agr. Bachic.* **18** fasc. 2–3 pp. 107–115, 7 refs. Milan, 1952.

Damage to grape vines in northern Italy by *Planococcus* (*Pseudococcus*) *citri* (Risso) has become severe [*cf. R.A.E.*, A **41** 243], and an account is given of experiments in 1952 on control by means of sprays of proprietary preparations of parathion and toxaphene. They were made in a heavily infested vineyard near Lake Garda, where treatment of a few vines in February with lime-sulphur had proved ineffective. The sprays were applied on 16th June, as the crawlers were hatching and before the leaves became infested, and contained 0·1 or 0·15 per cent. actual toxaphene or 0·02, 0·03, 0·034 or 0·05 per cent. parathion. Toxaphene was ineffective, but parathion at the two higher concentrations completely controlled the mealybug up to the time of picking. It was somewhat less effective at the lower concentrations, but infestation and honeydew-production at harvest were light. Since infestation was severe on the untreated vines, most of these were sprayed on 19th July with 0·05 per cent. parathion, and although the leaves and grapes were already thickly covered with honeydew and sooty mould, infestation was noticeably reduced within 15 days and the amount of damage at picking was within economic limits. Similar results were obtained by careful treatment of a small number of vines on 22nd July with 0·034 or 0·05 per cent. parathion, with no significant difference between concentrations. *Anagyrus pseudococci* (Gir.) was found throughout the vineyard parasitising large numbers of the mealybug [*cf.* **42** 340] and was apparently unaffected by the parathion treatments.

Costantino (G.). **La lotta contro la mosca delle frutta** (*Ceratitis capitata* **Wied.**). **Resultati di esperimenti mediante prodotti a base di DDT e di esteri fosforici (parathion).** [The Control of *C. capitata*. Results of Experiments with DDT and Parathion.]—*Tecn. agric.* 1952 no. 2 repr. 8 pp. Catania, 1952.

The experiments described were carried out in 1951 in the Province of Catanzaro, southern Italy, on peach in two mixed orchards. The first adults of *Ceratitis capitata* (Wied.) were taken in bait-traps containing 5 per cent. diammonium phosphate on 17th July, picking lasted from 16th August to 10th September, and the catches increased up to the end of that period. Treatments were applied on 6th and 28th July, and examinations of the fruits on the trees and on the ground between 8th August and 10th October showed that the percentages infested in the first and (in brackets) in the second orchard averaged 0·25 (0·21) and 0·22 (0·15) for 0·5 per cent. Gesarol 50 (containing 50 per cent. DDT) alone and with 0·2 per cent. adhesive, respectively, 0·64 (0·48) and 0·6 (1·5) for 0·75 per cent. Carposan 20 [containing 20 per cent. parathion] alone and with 1 per cent. oil emulsion, 0·58 (1·5) and 0·54 for 0·1 per cent. Carposan alone and with 1 per cent. oil emulsion, about 9 for a 5 per cent. DDT dust, and 18–19 (15–16) for no treatment.

Costantino (G.). **Stato attuale della lotta contro la mosca delle frutta** (*Ceratitis capitata* **Wied.**). **Risultati di esperimenti compiuti in Calabria negli anni 1952–53.** [The present Position regarding the Control of *C. capitata*. Results of Experiments in Calabria in 1952–53.]—*Ann. Sper. agr.* (N.S.) **8** no. 4 pp. 1283–1322, 1 fldg. map, 56 refs. Rome, 1954. (With a Summary in English.)

Experiments on the control of *Ceratitis capitata* (Wied.) in the Province of Catanzaro were continued in 1952–53 [*cf.* preceding abstract] on peach and orange. In 1952, the first adults were taken in bait-traps on peach in the different orchards on 10th–16th July, and the maximum was reached on 6th–16th September, after the peaches had been picked. Treatments were applied on 10th and 30th July and 20th August, and the percentages of fruits infested on eight dates between 5th August and 6th September are shown. The average percentages for the whole period were 37·5 for no treatment, 4·06 and 3·1 for 0·45 per cent. DDT in an emulsified solution alone and with 0·02 per cent. parathion, respectively, 4·3 for a wettable-powder spray of 0·015 per cent. parathion, 5·2 and 2·3 for an emulsion spray of 0·02 per cent. parathion alone and with 1 per cent. white summer oil, respectively, 0·9 and 0·8 for 0·5 per cent. wettable DDT alone and with

0·2 per cent. adhesive, 5·5 and 3 for 0·25 per cent. wettable DDT alone and with the adhesive, 7·3 for a 2 per cent. parathion dust, and 4·6 for a suspension spray of 0·15 per cent. of a product containing 16 per cent. γ BHC. The trees treated with DDT became heavily infested by *Tetranychus* sp. [*cf. R.A.E.*, A **42** 339], which migrated to them from vegetable and cereal crops, but infestation was less severe on trees treated with parathion or BHC and on untreated trees.

The same treatments were applied to orange and mandarin orange on 6th–7th October, 28th–29th October and 15th–16th November. Counts were made on 14th October and 16th November, and the percentages of fruits infested on the treated trees were almost the same on both dates, being about 1·9 and 1·4 for the DDT emulsion spray alone and with parathion, respectively, 2·4 for wettable parathion, 2·2 and 2 for the parathion emulsion spray alone and with summer oil, respectively, 0·8 and 0·6 for 0·5 per cent. wettable DDT alone and with the adhesive, 0·9 and 1 for 0·25 per cent. wettable DDT alone and with the adhesive, 2·6 for the parathion dust, and 1·4 for γ BHC, whereas they increased on untreated trees from 19·2 on 14th October to 29·8 on 16th November. Control was still maintained at a final count on 28th November.

In 1953, when the first adults were taken on peach on 9th–16th July, sprays of 0·3 and 0·5 per cent. of a paste containing 80 per cent. DDT and one of 0·25 per cent. DDT in a wettable powder with 0·2 per cent. adhesive were applied on 4th and 23rd July and gave almost complete protection, whereas about 85 per cent. of the fruits on untreated trees were infested. Sprays were applied to *Citrus* in the same orchard as in the previous year on 15th September, when the oranges were still green and the attack had not begun, and on 5th and 30th October. Counts were made on 5th and 29th October and 16th November, and the average infestation percentages for the whole period were less than 0·5 for 0·3 per cent. of the DDT paste, 0·3 per cent. DDT in an emulsified solution and a combined spray of 0·25 per cent. wettable DDT, 0·02 per cent. parathion in an emulsion, and 1 per cent. oil emulsion, and less than 0·1 for 0·25 per cent. wettable DDT with 0·05 per cent. wetter or 0·2 per cent. adhesive, 0·075 per cent. wettable chlordane with 0·2 per cent. adhesive, and 0·3 per cent. DDT with 1 per cent. oil emulsion, whereas they averaged 31·5 on untreated trees. The mixture of DDT, parathion and oil controlled *Chrysomphalus dictyospermi* (Morg.) and *Lepidosaphes* (*Mytilococcus*) *beckii* (Newm.), and none of the sprays injured the trees. It is shown from an analysis of costs that all are economically profitable.

Though DDT showed advantages over parathion, chlordane and BHC against *C. capitata*, the adults did not die for 36–48 hours after contact with the insecticide, it became less effective at temperatures above 30–32°C. [86–89·6°F.], and appeared to favour infestation by mites. The risk of poisonous residues on or in the fruits is briefly discussed from the literature [*cf.* **41** 243] and considered negligible. A list of the fruits cultivated in Italy that are susceptible to attack by *C. capitata* is included, together with one of the species and hybrids of *Citrus* that are immune.

Nizi (G.). **Disinfestazione dei bulbi di giacinto provenienti dall'Olanda e influenza esercitata sugli stessi dagli antiparassitari sperimentati.** [Disinfestation of Hyacinth Bulbs from Holland and the Effect on them of the Products tested.]—*Ann. Sper. agr.* (N.S.) 8 no. 4 pp. 1323–1336, 10 figs., 13 refs. Rome, 1954. (With a Summary in English.)

Hyacinth bulbs arriving in Italy from Holland were found to be infested by the mite, *Rhizoglyphus echinopus* (Fum. & Rob.), and an account is given of experiments carried out at Perugia in 1951–53 in an attempt to secure control. The bulbs were fumigated with carbon bisulphide at 5 lb. per 1,000 cu. ft. for 48 hours, exposed to a parathion smoke for 30 minutes, immersed for various periods in 4 per cent. formaldehyde or liquids containing BHC or DDT, or dusted with proprietary fungicides containing halogenated quinones or tetramethylthiuramdisulphide. None of the treatments proved effective.

VASSEUR (R.) & SCHVESTER (D.). **Procédés de lutte contre le xylébore disparate,** *Xyleborus dispar* **F. Col. Scolytidae.**—*Ann. Épiphyt.* **4** no. 2 pp. 167–172, 4 refs. Paris, 1953.

An experiment was carried out in 1950 on the control of *Xyleborus dispar* (F.) in an isolated apple orchard in the department of Saône-et-Loire. The orchard comprised some 380 trees, and though 24 that had been killed by the beetle had been removed and the dead wood pruned from others, there were still 86 infested trees that it was desired to save and that might serve as centres of dispersion. A mist spray of 0·2 per cent. DDT with 1 per cent. white summer oil was applied to 267 trees and a similar one of BHC to 50 on 28th March, when good weather had favoured emergence and fresh attacks were observed on about 20 of the trees. By 5th May, 25 of the trees that had been uninfested at the time of treatment had been attacked, but infestation had not developed, and there were no signs of further damage on the trees already infested at the time of spraying. Three of the untreated trees that served as controls were lightly infested, and the females that had entered them were destroyed mechanically. A further inspection on 2nd June showed no signs of infestation on any of the trees.

The removal and destruction of infested trees or branches gives good control of the beetle, so long as it is rigorously carried out, and is simpler than spraying, but the latter gives protection against reinfestation from neighbouring orchards, can be adapted to control other pests, and is advisable in cases of heavy or persistent attack.

ROBERT (P.). **L'évolution d'une population de hannetons communs** (*Melolontha melolontha* **L.**) **dans un foyer simple à Rouffach (Haut-Rhin).**—*Ann. Épiphyt.* **4** no. 2 pp. 257–281, 11 figs., 22 refs. Paris, 1953.

A detailed account is given of observations in 1949–52 on the development of a population of *Melolontha melolontha* (L.) in a small area, consisting of grassland and forest, near Colmar, France. Damage to the grassland by the larvae had been severe in 1948, but sampling at the time of pupation in 1949 and observations on flight in 1950 showed that adult emergence was slight in the patches that had been the most damaged and greater from areas that showed no injury. Emergence from the soil was completed between 29th April and 14th May, and the behaviour of the adults was similar to that recorded by Schneider [*R.A.E.*, A **42** 354], the beetles flying to one particular section of the forest edge in the evening for feeding. The oviposition flights began on 9th May and ranged over an area of grassland not exceeding 0·4 sq. mile close to the forest edge. The distribution of the eggs within this area varied considerably. In 1951, damage by the larvae was limited by rain, predacious birds and the application of insecticides to the most severely infested zone in April. In 1952, overpopulation in this zone led to complete destruction of the vegetation and almost complete mortality of the larvae, so that adults in the soil in autumn were more numerous in other, originally less heavily infested, areas. Overpopulation can thus cause an apparent shifting of the centre of infestation.

VASSEUR (R.) & BENASSY (C.). **Sur la faune parasitaire du pou de San José** (*Quadraspidiotus perniciosus* **Comst.**) **dans la région Lyonnaise et ses relations avec les conditions climatiques.**—*Ann. Épiphyt.* **4** no. 2 pp. 283–290, 2 graphs, 1 ref. Paris, 1953.

The two chief parasites of *Quadraspidiotus perniciosus* (Comst.) on fruit trees near Lyons are *Aphytis proclia* (Wlk.), which is apparently restricted to that Coccid and is the more important, and *A. mytilaspidis* (LeB.), which also attacks *Epidiaspis leperii* (Sign.) and *Lepidosaphes ulmi* (L.). The two species have similar bionomics and parasitise the adult females of *Q. perniciosus*. Since these do not survive the winter, the parasite population in spring is small, consisting only of individuals that became full-fed or pupated in the preceding autumn and overwintered under the scales of dead females. There appear to be 2–3 generations a year, and studies in 1948–52 showed that the percentage of parasitism varied with temperature and relative humidity, being highest in seasons with a high rainfall. The percentages in April–May, June–August and September–November were 0·4, 6 and 12·2, respectively, in 1948, when the average temperature was moderate and relative humidity high, 2·1, 3·1 and 10·3 in 1949 and 3·1, 3·2 and 9·9 in 1950, when the summer months were hot and dry, 2·2, 5 and 26·5 in 1951, when the temperature was moderate and relative humidity fairly high, and 6·7, 1·4 and 7·4 in 1952, when the temperature was high in June–July and July was extremely dry. Counts on apple in late October 1952 in Alsace and the department of Nièvre, where the summer had been less extreme, showed that 30 and 23 per cent., respectively, of the females of *Q. perniciosus* were parasitised. Parasitism reached 55–60 per cent. in the autumn of 1952 in greenhouses in which the temperature was high (with maxima of 40°C. [104°F.] or more) and the relative humidity never fell below 60 per cent., indicating that humidity is the important factor favouring parasitism.

MILAIRE (H.) & GIREAU (R.). **Quelques résultats de traitements d'hiver contre la cochenille du mûrier.**—*Phytoma* **7** no. 55 pp. 29–31, 3 figs. Paris, 1954.

Pseudaulacaspis (*Diaspis*) *pentagona* (Targ.) has been present on peach near Lyons for some years [*cf. R.A.E.*, A **28** 388], but has become more widespread and injurious since 1948. In experiments on control by means of winter sprays, in which trees in a heavily infested orchard were sprayed on 12th March 1952, counts on 24th April showed that the mortality percentages were 75·2 for a product of the soluble-oil type containing 90 per cent. oil with 5 per cent. DNC and 81·2 and 95·4 for two of the mayonnaise type containing 75 per cent. oil with 2·5 and 5 per cent. DNC, respectively, all at 3 per cent., and 36·6 and 49 for one of the mayonnaise and one of the soluble-oil type containing 80 per cent. oil with 1·5 and 3 per cent. parathion, respectively, both at 2·5 per cent., as compared with 20 for no treatment. DNC in oil, especially the soluble-oil product, injured the leaf and flower buds and appeared to soften the bark and soak into the wood. Injury was particularly severe near the base of the main branches, but was largely overcome by 10th April. It is recommended that sprays of

DNC in oil should be applied well before bud-burst, and in any case earlier than March, and that mulberry trees from which infestation may spread to peach should also be treated, at a rather higher concentration.

Barbotin (F.). **Essai de lutte contre la mouche de la carotte** (*Psila rosae* **L.**) **en Bretagne et en Normandie.**—*Phytoma* 7 no. 55 pp. 33–35, 2 figs. Paris, 1954.

Carrots in north-western France are severely attacked by *Psila rosae* (F.), and up to 80 per cent. of the crop was injured in some places in 1953. In this region, the adults of the overwintering generation emerge in late April and May, and those of the first generation in September–October. In field experiments in 1953, dusts of dieldrin, aldrin or chlordane were applied to the soil and lightly raked in before sowing. On light soil treated in early May, aldrin at 1·6 lb. and dieldrin at 1·4 lb. toxicant per acre permitted some attack by larvae of the first generation, and the percentages of sound carrots on 27th October were 79·8 and 86·8, respectively, as compared with 56·2 for no treatment. On heavy damp soil treated in late May, chlordane at 9 lb. and dieldrin at 0·9 and 1·8 lb. per acre protected the plants from attack by the first generation and the percentages of sound carrots on 27th October were 82·6, 87·9 and 94·8, respectively, as compared with 24·6 for no treatment.

Benas (G.) & Miquel (H.). **La lutte contre la mouche de la cerise** (*Rhagoletis cerasi* **L.**) **en Vaucluse.**—*Phytoma* 7 no. 56 pp. 5–10, 6 figs., 5 refs. Paris, 1954.

Since preserved cherries from southern France were refused entry into the United States in 1952 because they showed traces of infestation by *Rhagoletis cerasi* (L.), an experiment on the control of this fruit-fly was carried out in an isolated district containing 6,000 trees in the area in which the fruits concerned are grown. The date of adult emergence was determined by the use of bait-traps, and sprays of wettable DDT were applied to all the trees against the adults on 15th–18th May, 9–12 days after emergence began. The concentration of actual DDT was 0·1 per cent. in conventional sprays and 1 per cent. in atomised sprays, and a second application was made over half of the area, beginning on 25th May. The results were estimated on 10th–17th June, when the percentages of fruits infested were 0–1·6 for two applications, 1·1–6 for one, and 13·5–100 on untreated trees in a neighbouring zone.

Deloustal (J.). **L'opération-hanneton de Paimpont (Ille-et-Vilaine).**—*Phytoma* **6** no. 53 pp. 12–16, 3 figs.; **7** no. 56 pp. 15–17, 1 ref. Paris, 1953–54.

An account is given of a campaign against cockchafers [*Melolontha melolontha* (L.)] carried out near Rennes, Brittany, in 1953 in an area consisting of cultivated land almost completely enclosed by forest. About a third of the adults present in the soil emerged between 19th and 23rd April, during a warm spell, and a preliminary treatment was applied to forest edges during the next few days. The main emergence occurred in early May, and thorough treatment of all the forest edges was then carried out. The insecticide used was γ BHC in an oil solution, an emulsified solution and a dust, and it was applied at rates of about 5·2–7·2 oz. per acre. The oil solution was applied as a fog from a helicopter, which was used to treat the forest to depths of up to 80 yards and was also used in places where ground equipment could not penetrate. Examination of soil samples in September showed that the average numbers of larvae per sq. yard were less than five in treated areas and nearly 16 in an untreated one.

RISBEC (J.). **Contribution à l'étude des parasites du charançon du colza** *Ceuthorrhynchus assimilis* **Payk.**—*Rev. Path. vég.* **32** fasc. 1 pp. 37–43, 1 fig., 3 refs. Paris, 1953.

The parasites found attacking *Ceuthorrhynchus assimilis* (Payk.) on rape during investigations on that weevil to the north-east of Paris in 1952 [*cf. R.A.E.*, A **42** 407] comprised a Braconid that may have been *Perilitus melanopus* (Ruthe), which parasitised the adults [*cf.* **13** 203], *Trichomalus fasciatus* Thoms., which the author treats as a synonym of *T. herbidus* (Wlk.), and two other Pteromalids, *Anisopteromalus* (*Aplastomorpha*) *calandrae* (How.) and *Xenocrepis pura* Mayr, all of which attacked the larvae, and a Mymarid thought to be *Anaphes* (*Patasson*) *brachygaster* Debauche, which was reared from the eggs. Notes are given on the adult morphology of all but the first.

The larvae of the Braconid were found feeding within the body cavity of *C. assimilis* in spring, and the percentage parasitism was 50 on 15th April, 15–20 on 17th April, 2–7 on 25th April and 0–1·5 on 1st May. However, adults were taken only between 10th and 30th April, indicating the probable existence of an alternative host.

The females of *T. fasciatus* lay their eggs singly beside the larvae of *C. assimilis* within the pods [*cf.* **9** 605], and the larval, prepupal and pupal stages of one individual lasted 7, 3 and 8 days, respectively, in June. The first adults were observed on 18th April, on the rape flowers, newly-hatched larvae occurred from 26th May to 15th July, pupae were found from 4th June to 15th July, and adults were again present from 21st June. The number of generations a year is unknown. Only one example each of *Anisopteromalus calandrae* and *X. pura* was obtained, and *Anaphes brachygaster* was also not common.

DELMAS (H. G.) & THERMES (R.). **Sur la profondeur de pupaison de** *Ceratitis capitata* **Wied.**—*Rev. Path. vég.* **32** fasc. 1 pp. 44–49, 4 figs., 4 refs. Paris, 1953.

Since little is known of the depth at which *Ceratitis capitata* (Wied.) pupates in the soil in southern France, investigations were made near Perpignan in 1951–52. In a preliminary test in 1951, infested peaches were placed on undisturbed soil in October and the puparia recovered from it in November. Almost all were in the upper inch, and none lower than 2 ins. Since the fruits soon fermented, drowning many of the larvae, and then formed a hard cake that protected the soil, the peaches were placed on a grid above the ground in the further tests in 1952. The soil was predominantly sandy, and the fruits were exposed at intervals from mid-July until the end of September and removed as soon as the larvae had left them. Almost all the puparia were again recovered from the upper inch, and very few were found lower than 2 ins. There were no seasonal differences. To ascertain the depths from which emerging adults can reach the surface, puparia were placed at various levels in wide glass tubes containing sandy soil. The percentages of flies that successfully emerged ranged from 85 at less than 0·5 inch to 65 at 10 ins. and 6·5 at 20 ins.; none did so from a depth of 28 ins. It is concluded that only very deep ploughing, which is impracticable in orchards, would bury the puparia to a depth from which the adults could not reach the surface.

Sacantanis (K.). **Facteurs déterminant le comportement de** *Dacus oleae* **Gmel. vis-à-vis des variétés d'oliviers.**—*Rev. Path. vég.* **32** fasc. 1 pp. 50–57, 8 refs. Paris, 1953.

Investigations on olive trees of 40 varieties growing at an experiment station in Morocco in 1952 confirmed that the females of *Dacus oleae* (Gmel.) appear to show a marked preference for particular varieties early in the season and oviposit more readily in them. In laboratory tests, which are described, it was found that neither the colour nor the size of the fruits was the determining factor, though the varieties preferred usually had large fruits. The texture of the flesh and its resistance to the ovipositor seemed to be more important, the average time required for the completion of a puncture in the most heavily infested variety being nearly half that in one less heavily infested.

Walkley (L. M.). **A new Cryptine Genus of economic Interest (Hymenoptera: Ichneumonidae).**—*J. Wash. Acad. Sci.* **44** no. 7 pp. 219–220, 1 fig. Baltimore, Md., 1954.

Pseudischnus, gen.n., is erected for *Ischnus oregonensis* Cushm. [*R.A.E.*, A **28** 371]. *P. oregonensis* is a parasite of *Neodiprion tsugae* Middleton in the western United States [*cf. loc. cit.*], whereas all the known species of *Ischnus* (*Habrocryptus*) parasitise Lepidoptera.

Dutky (S. R.) & Gooden (E. L.). *Coxiella popilliae*, **n.sp., a Rickettsia causing Blue Disease of Japanese Beetle Larvae.**—*J. Bact.* **63** no. 6 pp. 743–750, 10 figs., 2 refs. Baltimore, Md., 1952.

A disease causing a blue discoloration of the fat-body and death was observed in larvae of *Popillia japonica* Newm. collected in Pennsylvania in October 1940 and has since been encountered at several widely separated places, mainly in larvae of *P. japonica*, but also in those of *Lachnosterna* (*Phyllophaga*) *anxia* (Lec.) and *L.* (*P.*) *ephilida* (Say). It was found at only a small proportion of the sites examined, but affected as many as 34 per cent. of the larvae recovered in individual diggings and may therefore prove an important means of control. Descriptions are given of the causal organism, which occurred as kidney-shaped rods 0·6 μ long and 0·2 μ wide, and of the macroscopic and microscopic characteristics of the disease. The taxonomic position of the organism is not clear. E. A. Steinhaus considered it to resemble more nearly a rickettsia than a virus of any of the types now known to occur in insects, and in view of this and its filterability, the authors propose the name *Coxiella popilliae*, sp. n., for it.

In experiments, healthy larvae of *P. japonica* were infected with *C. popilliae* by injection of suspensions of the blood of diseased larvae or of filtrates of these suspensions. Attempts to isolate and culture the organism on artificial media were unsuccessful, so that material for study could be maintained only by serial inoculation of larvae. Initially, only fresh blood suspensions were used, but later tests showed that suspensions were still infectious after refrigeration at 4°C. [39·2°F.] for 76 days. After injection, the larvae were incubated at constant temperature in individual tins of soil with sprouted seed as food, and examined for external symptoms at short intervals. The symptoms first appear as a bluish fluorescence of the thin layer of fat-body overlying the small intestine and the dark rectal sac. Preliminary studies indicated that 26·7°C. [80·06°F.] was the optimum and 30°C. [86°F.] nearly the maximum temperature for disease development.

The larvae were also infected by keeping them in soil inoculated with suspensions of the organism; six positive and four doubtful cases of infection were diagnosed among 50 larvae exposed for 40 days to soil inoculated with 720,000 million organisms per kg.

Ellis (P. E.). **The gregarious Behaviour of marching** *Locusta migratoria migratorioides* **(R. & F.) Hoppers.**—*J. exp. Biol.* **30** no. 2 pp. 214–234, 9 figs., 17 refs. London, 1953.

The following is virtually the author's summary. The amount of marching by fourth-instar hoppers of *Locusta migratoria migratorioides* (R. & F.) reared under crowded conditions was studied in relation to the total number of individuals and to the size of the cage. With fewer than 50 hoppers per cage, marching depended partly on the total number of hoppers present and partly on the number in relation to the area of the cage floor. With more than 50 hoppers per cage, marching probably depended on the total number present rather than on the area of the cage floor. In all cages, marching was greatly reduced with fewer than 30 hoppers, although even single individuals marched for part of the time. An investigation of the hopper interactions that lead to an increase in marching activity in groups showed that the two most important were visual and mechanical ones. Test hoppers followed moving hopper bodies alive or dead, but gave only a partial response to moving vertical stripes. Mechanical interactions between hoppers greatly increased the proportion of reacting hoppers, but did not increase the distances travelled by the active individuals beyond those travelled in response to optical stimuli alone. Maximal marching activity, by the maximal proportion of hoppers in a band, depended on an opto-motor response to a moving background of hopper shapes and to the physical contact between hoppers. Air and floor vibrations from other marching hoppers played only a small part in marching, whereas stimuli received by the antennae tended to inhibit marching when total activity was low. The importance of the experimental results in explaining the behaviour of locust hoppers in the field is discussed.

Häfliger (E.). **Neue Beiträge zur Bekämpfung der Kirschenfliege** (*Rhagoletis cerasi* **L.**). [New Contributions to the Control of *R. cerasi.*]—*Z. PflKrankh.* **60** pt. 5 pp. 246–260, 4 graphs, 10 refs. Ludwigsburg, 1953. (With a Summary in English.)

DDT is effective against the ovipositing adults of *Rhagoletis cerasi* (L.) on cherry but has to be applied before oviposition begins, and again later, for complete protection of the crop. Parathion is toxic to the eggs or young larvae in the fruits [*cf. R.A.E.*, A **42** 69–70], and as the addition of it to the DDT spray might permit control by a single application made after oviposition has begun, tests with proprietary preparations of these materials alone and in combination were made on cherry in Switzerland. Diazinon [O,O-diethyl O-(2-isopropyl-4-methyl-pyrimidinyl(6)) thiophosphate], which is similar in effect to parathion but less toxic to mammals [*cf.* **41** 399], was compared with it in some of the tests.

In the first experiment, in which the treatments were applied over considerable areas, the trees were sprayed with 0·1 per cent. DDT from a wettable powder on 28th May and 10th June, about three weeks before the main harvest, and with emulsion sprays of 0·02 per cent. parathion alone or in combination with 0·1 per cent. DDT on 10th June, when a third of the fruits showed oviposition punctures. Since the effectiveness of the parathion treatment depends on coverage of all the fruits, twice as much spray was used per tree as for DDT alone. Observations 20 days after spraying showed that the percentages of fruits infested were 68–72 for no treatment, 4 for parathion alone and 0–2 for each of the other treatments.

In the second experiment, single trees were treated with similar combined sprays, and good control was obtained, but no conclusions are drawn as reinfestation from neighbouring untreated trees, which depends largely on temperature and carriage of the adults by wind, was slight. The importance of thorough coverage of the fruits was demonstrated in a test in which normal spraying reduced infestation from 19 to 9·5 per cent. and more thorough treatment reduced a much heavier infestation to 6–7 per cent. Emulsions and suspensions of the combined materials were about equally effective on single trees, parathion alone was inferior in wettable-powder form to the mixed spray and ineffective in an emulsion spray, and 0·04 per cent. Diazinon in an emulsion gave promising results.

Investigations on the duration of effectiveness of 0·04 per cent. parathion and 0·02–0·04 per cent. Diazinon in emulsion sprays were carried out on one tree of a slow-ripening variety. The fruits were examined for oviposition punctures from the beginning of the experiment, the tree was sprayed on 10th–11th June, when 10–14 per cent. of the cherries showed punctures, and individual branches were caged on 20th June, to prevent further oviposition. Examination on 7th July showed that the percentage of punctures giving rise to larvae was low at first but rose to 100 for fruits punctured on 18th June, and there was no relation between the date of the early punctures and the stage reached by the larvae, since development was retarded in unripe cherries [*cf.* **42** 349]. About 20 per cent. of the fruits punctured on 17th–20th June showed emergence holes, so that egg and larval development in them had been completed in 18 days or less. Both parathion and Diazinon gave some 80–100 per cent. control of the larvae in fruits punctured during the first five days after treatment, but the significance of these figures was slight, since comparatively few larvae developed in untreated fruits. Effectiveness then fell rapidly, but both materials still gave 50 per cent. mortality after ten days. They had no repellent effect on the adults.

Parathion residues on and in treated fruits from the field tests, assessed by bioassay in the laboratory, amounted to 5 parts per million for freshly-sprayed cherries and 0·1 p.p.m. for those sprayed 4–10 days previously. Since these still apparently gave good mortality in the field, the minimum effective concentrations of parathion and Diazinon were established by momentarily immersing fruits containing larvae of all ages in emulsions containing graded concentrations of each insecticide. Emergence of the larvae was observed for five days, after which mortality was assessed by dissecting the fruits. Larvae that emerged from untreated fruits pupated directly. Few emerged from the treated fruits, and most of those died without pupating. The toxicity of both insecticides did not decrease until the concentration fell below 0·002 per cent., so that the concentration used in the field appeared to have been excessive.

It is concluded that a single combined application of DDT and parathion three weeks before harvest is as effective as two applications of DDT alone in large-scale operations and superior to one of parathion alone for treating individual trees.

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The second part is a similar catalogue of the parasites and predators; it shows their hosts, the countries in which they attack particular hosts, and those into which they have been introduced.

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